

(NASA TM X 51524;
MHM - 7, VOL. 2)

VOLUME TWO
SUPPORTING DOCUMENTS



90p.



N64-17797*

CODE-1

TMX-51524

HISTORY ***of the***

GEORGE C. MARSHALL **SPACE FLIGHT CENTER**
HUNTSVILLE, ALABAMA

OTS PRICE

XEROX	\$	<u>8.10 pl</u>
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JANUARY 1 - JUNE 30, 1963

(NASA TMX 51524; MHM-7)

Partial copy

MSFC Historical Monograph No. 7

(MHM-7)

HISTORY OF THE GEORGE C. MARSHALL SPACE FLIGHT CENTER

FROM JANUARY 1 THROUGH JUNE 30

1963 ,

Volume Two:

SUPPORTING DOCUMENTS

[5]

~~George C.~~ Marshall Space Flight Center
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION.
Huntsville, Alabama

November 1963

90 p ref

VOLUME II

SUPPORTING DOCUMENTS

- I. Applied Costs of R&D Budget Line Items
- II. Total MSFC Manpower Summary
- III. Personnel Assignments Within MSFC
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I

APPLIED COSTS OF R&D BUDGET LINE ITEMS

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

TO Chief, Historical Office, M-MS-H

DATE August 22, 1963

FROM Budget Officer, M-FIN-B

SUBJECT MSFC Costs for Period January 1, 1963, through June 30, 1963

1. MSFC direct program costs and applicable indirect costs are summarized briefly as follows:

Classification

Actual Costs
(In thousands of dollars)

Direct Costs

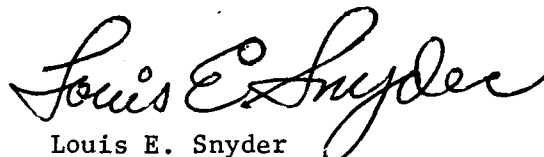
Saturn I	118,718
Saturn IB	3,735
Saturn V	176,311
Centaur Development <u>1/</u>	504
Nova Development	2,409
H-1 Engine Development	4,678
RL-10 (A-3) Engine Development	17,133
F-1 Engine Development	33,490
M-1 Engine Development <u>1/</u>	25
J-2 Engine Development	25,371
Adv. Research and Technology	8,894
Vehicle Procurement	33,702
RIFT	6,212
Reimbursable	979
Other	<u>5,466</u>
Total Direct Costs	<u>437,627</u>

Indirect Costs

	<u>42,550</u>
TOTAL Costs	<u><u>480,177</u></u>

1/ These projects have been transferred to LeRC.

2. This represents an increase of approximately 126 Million over the previous six months costs (July 1, through December 31, 1962) of 354 Million.

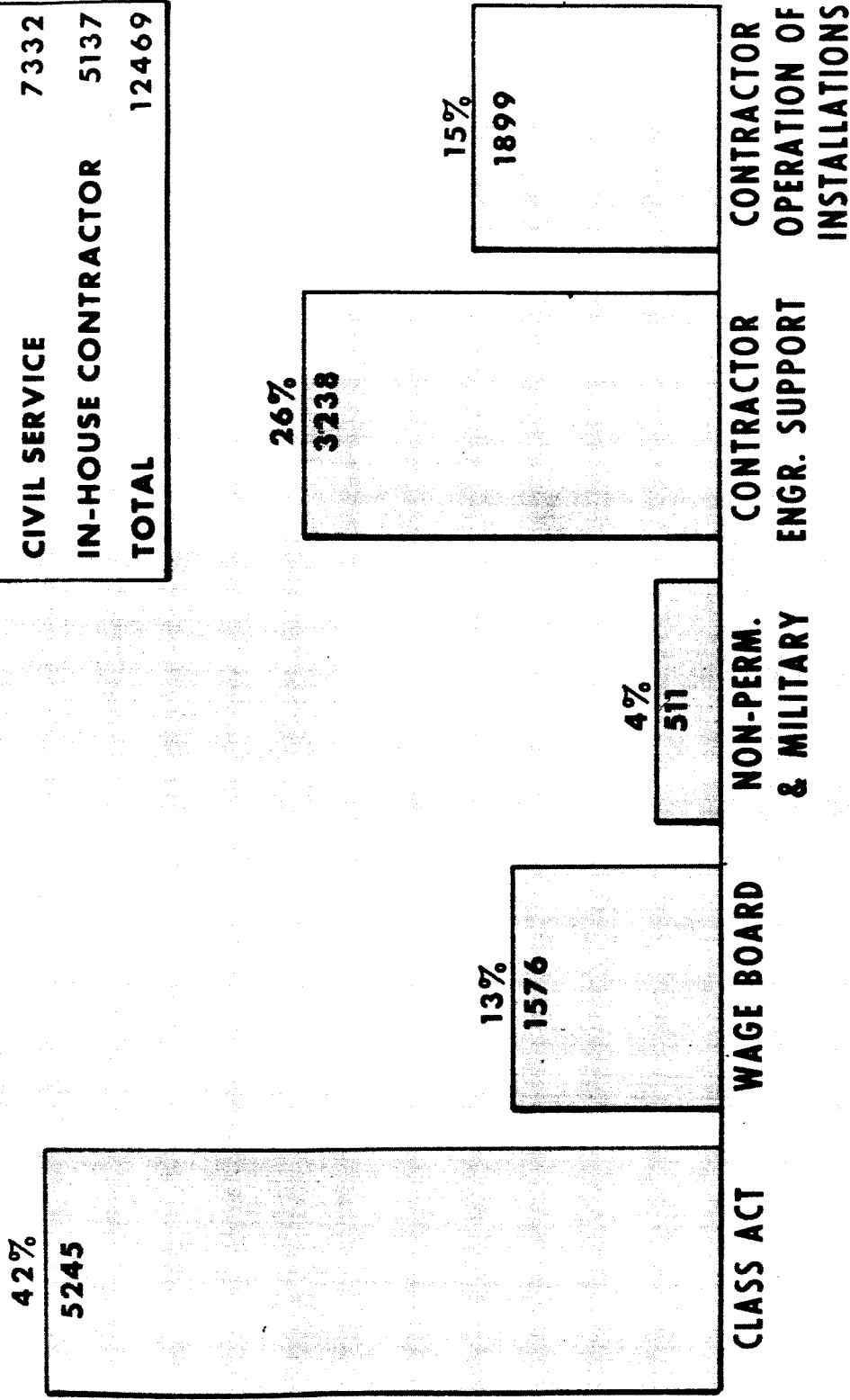

Louis E. Snyder

II

TOTAL MSFC MANPOWER SUMMARY

TOTAL MSFC MANPOWER

SUMMARY		
CIVIL SERVICE		7332
IN-HOUSE CONTRACTOR		5137
TOTAL		12469

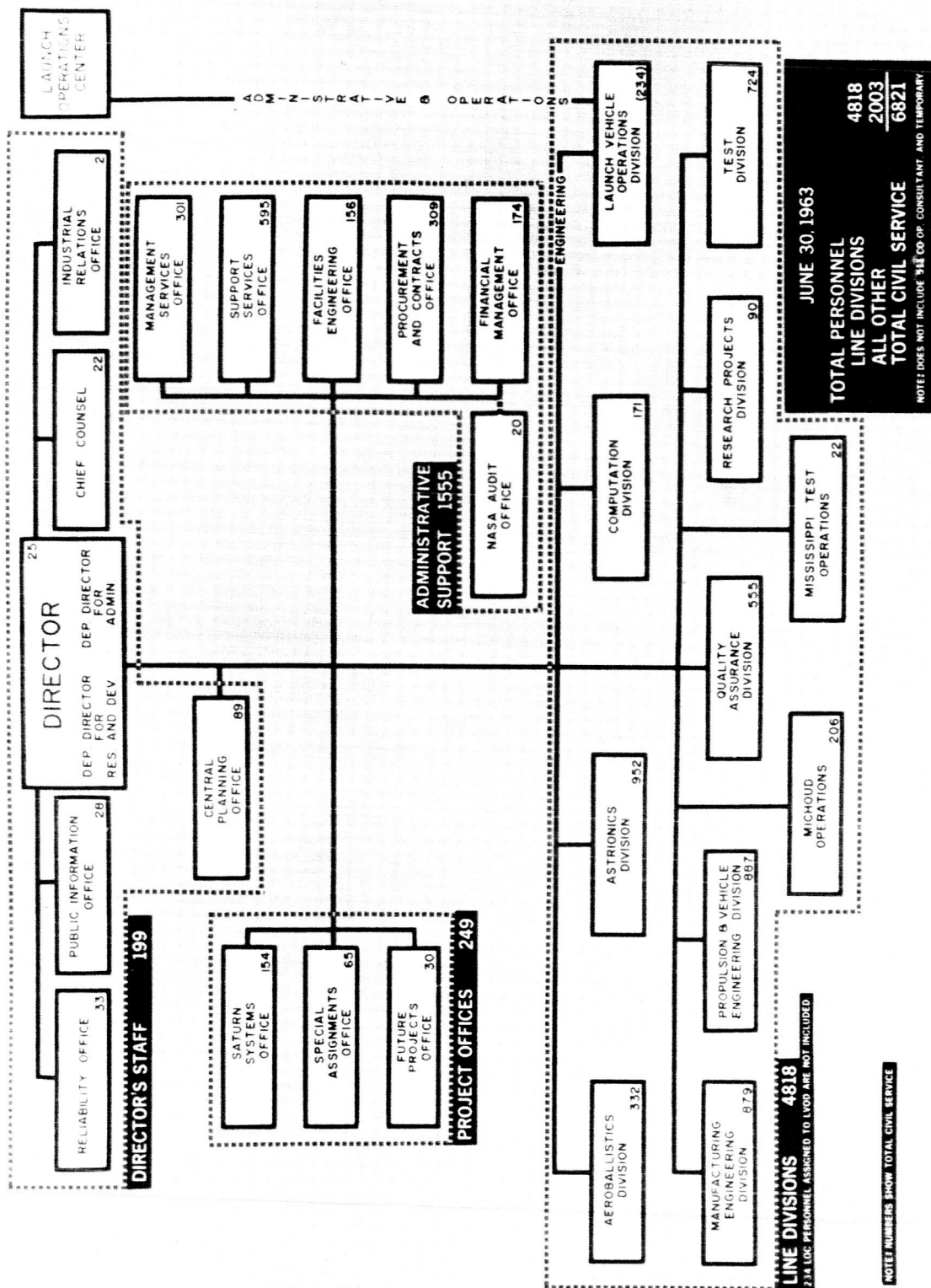


M-MS-P PARHAM JUNE 30, 1963 MONTHLY M-CP-D 555 B

III

PERSONNEL ASSIGNMENTS WITHIN MSFC

GEORGE C. MARSHALL SPACE FLIGHT CENTER



IV

INCENTIVE AWARDS PROGRAM DATA

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

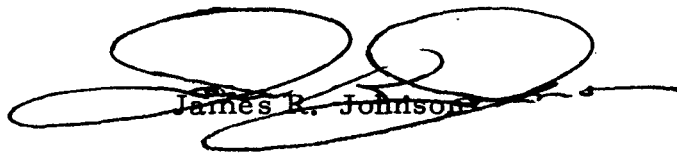
TO Chief, Historical Office, M-MS-H

DATE July 11, 1963

FROM Chief, Incentive Awards, M-MS-PI

SUBJECT Incentive Awards Program Data

Attached for inclusion in the Center's historical report is incentive awards program data for the period January 1, 1963, through June 30, 1963.



James R. Johnson

1 Enc:
a/s

Incentive Awards Program Data
(January 1, 1963, through June 30, 1963)

1. Eighty-seven sustained superior performance award nominations were received by the Incentive Awards Committee during the period covered. Sixty-five were approved for cash awards totaling \$20,625. (This includes \$500 for two awards to employees of the Office of Manned Space Flight which will be paid by NASA Headquarters.) The names and work locations of employees for whom sustained superior performance awards were approved are as follows:

Linda G. Edmonson	Astrionics Division
Sarah C. Swann	Support Services Office
William C. Snoddy	Research Projects Division
James F. Gambrell	Support Services Office
Pauline C. Watson	Office of Manned Space Flight
Carolyn Y. Petty	Office of Manned Space Flight
Jesse L. Seal	Astrionics Division
Ronnie W. Phillips	Propulsion and Vehicle Engineering Division
James R. McMenemy	Management Services Office
William R. Lucas	Propulsion and Vehicle Engineering Division
Davis E. Foxworthy	Support Services Office
Martin O. Burrell	Research Projects Division
Thomas E. Kinser	Research Projects Division
Harold K. Katz	Management Services Office
Jimmie L. Cook	Support Services Office
Elna F. Brooks	Quality Assurance Division
Joyce W. Griffith	Management Services Office
Ethel S. Apostolos	Propulsion and Vehicle Engineering Division
Edna H. Hill	Support Services Office
C. Dale Andrews	Aeroballistics Division
Hyman L. Hooper, Jr.	Aeroballistics Division
Jane P. Greene	Aeroballistics Division
Robert E. Turner	Aeroballistics Division
Wyllodene P. Thompson	Procurement and Contracts Office
Nancy E. Rowzee	Financial Management Office
Robert C. McAnnally	Aeroballistics Division
Frank M. Childers	Launch Vehicle Operations Division
Gloria J. Hodge	Propulsion and Vehicle Engineering Division
Barbara G. Armor	Astrionics Division
Elva L. Reitzel	Astrionics Division
Victor R. Neiland	Propulsion and Vehicle Engineering Division
Charlie F. Johnson	Propulsion and Vehicle Engineering Division
Hermann K. Weidner	Propulsion and Vehicle Engineering Division
Roma D. Bowers	Financial Management Office
Mildred M. Carmack	Management Services Office

Incentive Awards Program Data

Lynn Jonakin	Support Services Office
Richard W. Weaver	Support Services Office
Dorothy C. Franklin	Management Services Office
Virginia M. Jeffers	Support Services Office
John G. Simpson	Facilities Engineering Office
Eugene M. Davis	Manufacturing Engineering Division
Elsie C. Hull	Support Services Office
Anna R. Smith	Procurement and Contracts Office
Stephen C. Bartley	Management Services Office
Entys C. Yelverton	Propulsion and Vehicle Engineering Division
Bessie P. Phillips	Propulsion and Vehicle Engineering Division
Richard A. Merritt	Support Services Office
Doris B. Nelson	Propulsion and Vehicle Engineering Division
William M. Broad	Quality Assurance Division
Robert A. Dornbos	Quality Assurance Division
Florida P. Frady	Propulsion and Vehicle Engineering Division
Barbara M. Shannon	Propulsion and Vehicle Engineering Division
Kathryn F. Carter	Support Services Office
James O. Mitchum	Financial Management Office
Juanita A. Patterson	Propulsion and Vehicle Engineering Division
Linda P. Berry	Support Services Office
Daniel T. Martin	Aeroballistics Division
Dorothy S. Pearson	Astrionics Division
Kay Carter	Astrionics Division
Jamie M. Humphreys	Astrionics Division
Lyle R. Dickey	Aeroballistics Division
Rosalie A. Lewis	Support Services Office
Ozell F. Harris	Support Services Office
Arthur J. H. Kroeger	Propulsion and Vehicle Engineering Division
Billy W. Shelton	Propulsion and Vehicle Engineering Division

2. The following employees received "outstanding" performance ratings during the period: William R. Lucas, Propulsion and Vehicle Engineering Division; Clemons T. Glen, Office of Manned Space Flight; and Hermann K. Weidner, Propulsion and Vehicle Engineering Division.

3. Three hundred fifty-one suggestions were received. Eighty-six were adopted with estimated first year net savings of \$46,721. Suggesters received \$3,215 in awards for adopted suggestions.

4. Two nominations for the Rockefeller Public Service Award were forwarded to NASA Headquarters for coordination with the awarding organization.

Incentive Awards Program Data

5. Invention awards in the amount of \$1,800 were approved by NASA Headquarters for Center employees as follows: Robert J. Schwinghamer, Manufacturing Engineering Division, \$100 for his invention entitled "Electric Discharge Apparatus for Forming" and \$400 for his invention entitled "Space Vehicle Electrical System"; Hans F. Wuenscher, Manufacturing Engineering Division, \$200 for his invention entitled "Recoverable Rocket Vehicle"; William McCampbell and James C. McCaig, co-inventors, Manufacturing Engineering Division, \$150 for their invention entitled "Electric Arc Spot Welding"; Oscar C. Holderer, Aeroballistics Division, \$100 for his invention entitled "Electric Arc Driven Wind Tunnel"; Josef Boehm, Astrionics Division, \$50 for his invention entitled "Gravity Device"; Hermann R. Wagner and Leonard L. Mitchum, Jr., co-inventors, Astrionics Division, \$500 for their invention entitled "Collapsible Loop Antenna System for Spinning Space Vehicles"; Josef Boehm and Adolf L. Hermann, co-inventors, Astrionics Division, \$100 for their invention entitled "Components for Printed Circuitry"; and Willis G. Groth, Manufacturing Engineering Division, \$200 for his invention entitled "Optical Inspection Instrument. "

6. Two hundred five letters of appreciation and forty letters of commendation were presented Center employees during this period.

7. The following Center employees received non-Federal awards as indicated:

Sloan Fellowship in Executive Development:

Robert E. Pace, Jr., Project Engineer, Research Projects Division
Thomas F. Moring, Technical Staff Assistant, Saturn Systems Office

Honorary Doctorate:

Dr. Wernher von Braun, Director

Hermann Oberth Medal:

Heinz H. Koelle, Director, Future Projects Office

Woodmen of the World Award:

Dr. Wernher von Braun, Director

Incentive Awards Program Data

William A. Jump Memorial Award:

William H. Fortenberry, Chief, Automatic Data Processing
Systems Branch, Computation Division

1963 American Citizenship Award:

Dr. Wernher von Braun, Director

8. Following is a breakdown of NASA honorary service emblems awarded Center employees during the period covered:

40-year	-
30-year	4
20-year	102
15-year	266
10-year	266
1-year	622
Totals	<u>1260</u>

9. During the fiscal year, Center employees received a total of \$42,295 in cash awards as follows: \$5,945 in suggestion awards, \$32,800 in sustained superior performance awards, and \$3,550 in invention awards. In return, the Center realized \$304,213 in measurable benefits from employee contributions.

V

PATENTS ISSUED TO MSFC EMPLOYEES

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

Mrs. Wilbourn/536-9224

TO Mr. David S. Akens, M-MS-H DATE August 27, 1963

FROM Associate Chief Counsel for Patent Matters, M-LGL-P

SUBJECT Patents Issued to MSFC Employees During the Period January 1, 1963 - June 30, 1963

As requested by your office, a list of patents issued to MSFC employees during the period beginning January 1, 1963 and ending June 30, 1963, as follows:

<u>Inventor</u>	<u>Number</u>	<u>Title</u>	<u>Issued</u>
Oscar C. Holderer	3,072,378	Gate Valve	1-8-63
Georg O. Landwehr	3,072,877	Connection Device	1-8-63
Hans F. Kennel	3,074,682	Torque Compensation Device	1-22-63
Leonard L. Mitchum Hermann R. Wagner	3,077,599	Collapsible Loop Antenna for Space Vehicle	2-12-63
Alan J. Fisher	3,079,516	Constant Temperature Piezoelectric Crystal Enclosure	2-26-63
Walter Haeussermann Adolf Hermann	3,092,918	Satellite Motion Simulator	6-11-63

James O. Harrell
for L. D. Wofford, Jr.

VI

TEST DIVISION'S HISTORICAL REPORT, JANUARY 1 - JUNE 30, 1963

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

TO M-MS-H, David S. Akens
Mr. Sweetland/pan/876-8815
DATE August 23, 1963

FROM Director, Test Division, M-TEST-DIR

SUBJECT Test Division's Historical Report, January 1-June 30, 1963

During the first six months of 1963, the following major events took place in Test Division:

a. The Static Test Tower East modifications were completed for the Saturn I, Block II configuration vehicle in January 1963.

b. SA-5

SA-5, the first flight version of the Block II vehicle, was installed in the Static Test Tower on January 28, 1963, and the first short duration static firing (SA-11) was conducted on February 27, 1963, for a duration of 31.96 seconds. All engine parameters were normal.

The first full duration firing (SA-12) of the SA-5 stage was conducted on March 13, 1963, for a duration of 141.44 seconds. Due to several improper conditions, a second duration firing was determined necessary to insure that the stage was flightworthy. The second duration firing (SA-13) took place on March 27, 1963, for a duration of 143.47 seconds. All systems and engines operated satisfactorily during the test.

SA-5 was removed from the Static Test Tower on April 2, 1963.

c. SA-6

SA-6 was installed in the Static Test Tower East on April 22, 1963, and a short duration firing (SA-14) was conducted on May 15, 1963, for a duration of 33.75 seconds. At cutoff the lox valve on engine 8 failed to close, and fire continued to erupt from the engine for some time causing damage to the chamber tubes and the injector baffle. The engine had to be replaced.

Test SA-15 (long duration) was successfully conducted on June 6, 1963, for a duration of 142.37 seconds.

SA-6 was removed from the Static Test Tower on June 17, 1963.

Subject: Test Division's Historical Report,
January 1-June 30, 1963

August 23, 1963

d. Single Engine Testing (H-1)

During this period, 22 single engine tests were conducted at the Power Plant Test Stand, for a total of 1,637.05 seconds. These tests were conducted: a) checkout new thrust measuring system; b) calibrate new engines; c) in conjunction with the sound suppression program; d) F-1 engine (model) fuel suction lines; and e) compare special fuel (Rg-89-A) with RP-1. Test numbers, durations, and dates are as follows:

DATE	TEST NO.	DURATION (SEC)	DATE	TEST NO.	DURATION (SEC)
1/17/63	P1-370	10.0	4/24/63	P1-381	139.2
1/23/63	P1-371	75.0	5/8/63	P1-382	146.2
1/29/63	P1-372	40.0	5/17/63	P1-383	39.2
2/9/63	P1-373	8.5	5/21/63	P1-384	120.02
2/15/63	P1-374	40.0	5/23/63	P1-385	150.0
2/18/63	P1-375	150.0	6/10/63	P1-386	150.03
2/28/63	P1-376	5.0	6/14/63	P1-387	150.0
3/1/63	P1-377	5.0	6/17/63	P1-388	150.0
3/2/63	P1-378	5.0	6/19/63	P1-389	150.0
3/5/63	P1-379	4.0	6/24/63	P1-390	35.0
4/18/63	P1-380	29.9	6/24/63	P1-391	35.0

e. RL10 Engine Tests

During this period, testing continued on the RL10A-1 liquid hydrogen rocket engine. In March, following removal of the RL10A-1 engine, an RL10A-3 engine was installed in the Liquid Hydrogen Test Stand. This engine is of the S-IV engine configuration.

The following table summarizes the captive firings conducted at the Liquid Hydrogen Test Facility. NOTE: The letters H, HH, CR, and C following the test number indicate the type test that was performed, i.e., H, hot firing, HH, helium heater; CR, propellant recirculating pump test; C, cold flow.

Subject: Test Divison's Historical Report,
January 1-June 30, 1963

August 23, 1963

DATE	TEST NO.	DURATION (SEC)	DATE	TEST NO.	DURATION (SEC)
<u>RL10A-1</u>			5/10/63	056-HH	42.6
1/11/63	037-H	90	5/10/63	057-HH	410.0
1/18/63	038-C	3.5	5/17/63	058-HH	71.7
1/30/63	039-C	4.0	5/18/63	059-HH	1.7
2/1/63	040-H	174.0	5/18/63	060-HH	21.0
2/6/63	041-C	4.0	5/24/63	061-CR	N/A
2/8/63	042-H	20.0	5/29/63	062-HH	480.0
2/14/63	043-H	40.0	5/29/63	063-HH	480.0
2/19/63	044-C	4.0	6/6/63	064-HH	0.61
<u>RL10A-3</u>			6/6/63	065-HH	28.0
3/21/63	045-C	3.0	6/7/63	066-HH	84.4
3/22/63	046-C	3.0	6/7/63	067-HH	470.0
3/22/63	047-H	40.0	6/15/63	068-H	1.9
3/27/63	048-H	176.0	6/15/63	069-H	17.75
3/29/63	049-H	0.5	6/15/63	070-H	5.2
3/29/63	050-H	40.0	6/21/63	071-CR	0.0
4/17/63	051-H	151.1	6/21/63	072-CR	210.0
4/18/63	052-H	56.84	6/21/63	073-CR	0.0
4/23/63	053-H	183.3	6/21/63	074-CR	0.0
4/26/63	054-H	166.9	6/28/63	075-HH	31.0
5/8/63	055-HH	0.0	6/28/63	076-HH	316.0

Subject: Test Division's Historical Report,
January 1-June 30, 1963

August 23, 1963

f. S-I Dynamic Test Stand

Testing began on the SA-D5, January 8, 1963, with the booster, instrument unit, payload adapter, and payload assembled in the Dynamic Test Stand.

The SA-D5 vehicle was removed from the test stand the week of March 18, 1963, and preparations began for shipment of the booster to the Cape for use in the "wet" test. The S-I-5D, aboard the barge PROMISE, departed MSFC on April 5, 1963, for the Cape.

Testing began on the upper stage (S-IV-5D), the instrument unit, and the payload on May 4, 1963.

On May 17, 1963, the Jupiter nose cone was removed from the S-IV-5D and the Apollo and associated units (service module, support module, and escape system) were installed. Testing began May 23, 1963.

During the last two weeks of June 1963, the six RL10 engines for the S-IV-5D stage were received and installed. Testing will continue.

g. Sound Suppression Program

Testing in the model sound suppression program has continued, using different thrust model engines of the H-1 and F-1 configurations, and various arrangements of the model sound suppression hardware in an effort to develop better and more economical methods of reducing the sound generated by large booster engines.

Based on the successful model sound suppression program (in which a sound reduction of 15 decibels or more has been obtained) and its simplicity of operation, it was decided to build a prototype suppressor for a 188,000-pound rocket engine, the H-1. This prototype suppressor, itself, represents a model for the much larger power plants of the Advanced Saturn and Nova-type vehicles.

The old Jupiter "Hop" Stand was selected for the test site. On April 3, 1963, the first of six tests was conducted on a dry deflector coated with concrete to determine the baseline for the sound suppression study. The tests were completed, and the dry deflector was removed on April 26 and 27, 1963.

The first firing (SS-07) on the sound suppressor was conducted on June 17, 1963, for a duration of 4 seconds, with no major damage to the hardware.

Subject: Test Division's Historical Report,
January 1-June 30, 1963

August 23, 1963

The second test (SS-08) was conducted on June 21, 1963 for a 11-second duration. No major damage to the hardware was incurred. Test SS-08 concluded the tests that were conducted during this period. All indications are that the sound suppressor has met all test objectives. Testing will continue.

h. Facilities

1. Saturn Static Test Facility (S-10) - The concrete pouring is 95% complete. The steel erection equipment has been put in place, the deflector support framework has begun, and the technical systems contractor has started cable work.
2. Modification, West Side Static Test Tower - The West side of the Static Test Tower is being converted to an F-1 engine test stand. The brick and mortar work is complete. The technical systems contract is expected to be let in August 1963.
3. F-1 Test Stand - Concrete is being placed above grade on the concrete towers and below grade on the terminal building.
4. Expansion of Blockhouse/J-2/S-IVB Facility - The construction of the blockhouse is proceeding on schedule. A request has been made for BOD of October 1, 1963, for portions of the addition. The 100% drawings for the J-2/S-IVB facility were received on June 12, 1963.
5. Components Test Facility - The 90% design review is scheduled to be held in July for the brick and mortar portion. The 30% design review for the technical systems is scheduled for the first week in July 1963.
6. F-1 Turbopump Facility - The contractor is completing site preparations and has started excavation for the tower base. Completion is scheduled for November 1963.
7. Instrument Laboratory - Work began on June 19, 1963. Completion is scheduled for June 1964.
8. Advanced Saturn Dynamic Test Facility - Site preparation has been completed. Concrete is now being poured for the bases.
9. Second Addition to Engineering Building - Cleaning and some basic grade work are complete. (This building will be connected to the Engineering Building reported in the previous report.)

Subject: Test Division's Historical Report,
January 1-June 30, 1963

August 23, 1963

i. Transportation

1. Barge PALAEMON - In January 1963, the barge PALAEMON with the SA-5 "mock-up" aboard, enroute to Michoud, became ice-bound for three weeks near Paducah, Kentucky. The barge arrived in New Orleans on March 9, 1963. After docking in New Orleans for a short stay, the PALAEMON departed for the Cape to bring the S-I-5D back to MSFC. (The S-I-5D was transported to the Cape earlier aboard the PROMISE, to be used for wet test.) The PALAEMON is scheduled to arrive at MSFC on July 14, 1963, with the S-I-5D.

2. Barge PROMISE - The barge PROMISE sailed for AMR on January 20, 1963, with the SA-4 (booster), S-IV (dummy Stage), S-VD (payload), and the water tank (ballast tank). The barge arrived at AMR on February 2, 1963. The PROMISE returned to MSFC, and on April 5, 1963, departed for AMR with the S-I-5D. The barge arrived at AMR, April 16, 1963. The barge was drydocked at New Orleans on April 21, 1963, for annual maintenance, and returned to MSFC on May 15, 1963, to await shipment of the SA-5.

j. Ground Support Equipment

1. Umbilical Tower Swing Arms for SA-5 - After numerous failures with the DAC-designed quick-disconnect housing for the SA-5 swing arms and the successful testing of the LOC design, it was decided to use the LOC design in the SA-5 launch and future Block II vehicles.

2. Holddown Arms (Block II), VLF-37 - Testing of the first set (8) of Block II holddown arms was completed January 15, 1963, and were shipped to LOC on January 17, 1963.

The test program was approximately 75% complete on the second set (8) of Block II holddown arms when cracks were discovered forward of the lifting lug on the upper part of the arm casting. Hayes International Corporation was given a contract to repair the arms. (The first set of arms was examined by LOC, and no cracks were found.) In June 1963, after repairs were made, the test program was re-started on the last four arms, when one of the pivot pins for the upper arm linkage broke during assembly. The material was analyzed, and recommendations were made to use a stronger type of metal for the pins. LOC is ordering replacement pins for all the hold-down arms.

3. Short Cable Masts (SA-4) - Acceptance testing of these masts was completed and the masts were shipped to LOC on January 14, 1963.

Subject: Test Division's Historical Report,
January 1-June 30, 1963

August 23, 1963

4. Fuel and Lox Fill Mast (Block II) - Acceptance testing of these masts was completed and the masts were shipped to LOC on February 5, 1963.

5. Propellant Retractable Coupling for Liquid Hydrogen (Saturn V Program) - This is a prototype design utilizing the ball-socket coupling principle of the Saturn I lox and fuel masts, but mounted horizontally instead of at an angle. Ten tests were conducted and no leakage problems were encountered.

Karl L. Heimburg

Karl L. Heimburg

VII

MICHOUD OPERATIONS HISTORICAL REPORT

January 1, 1963, through June 30, 1963

Memorandum

TO Chief, Historical Office, M-MS-H DATE September 11, 1963

FROM Assistant General Manager, M-MICH-MGR

SUBJECT Historical Report

Enclosed is Historical Report for the Michoud Operations for the period January 1, 1963 through June 30, 1963.

M. Keith Wible
M. Keith Wible

Enc
a/s

HISTORICAL REPORT

M I C H O U D O P E R A T I O N S

January 1, 1963 - June 30, 1963

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ADMINISTRATION & SUPPORT OFFICE

CHAPTER I: ADMINISTRATION & SUPPORT OFFICE

General

On May 16, 1963, the Director, MSFC, approved a reorganization of Michoud Operations. The primary change in organization was the establishment of a separate P&C Office at Michoud. Incident to this reorganization, five Contract Administration employees were transferred to the new P&C Office, effective June 24, 1963, the personnel authorization for Michoud was accordingly reduced by five to a new total of 232, the present ceiling. The current organization chart for Michoud Operations is shown in Attachment No. 1.

The reorganization changed the name of the Administration and Support Office to "Administration Office" and support services functions were transferred to the new Support Operations Office. The Administration Office will administer the Safety, Personnel, Security, Management Analysis, and Administrative Services programs. In addition, it will concentrate on such functions as management studies, policies and procedures, organizational relationship and analysis, and manpower studies.

Personnel

The following is a breakdown of personnel at Michoud Operations on June 30, 1963:

The Boeing Company-----	3,609
Chrysler Corporation-----	2,622
Mason-Rust-----	633
NASA-----	208
Rocketdyne-----	9
Telecomputing-----	57
TOTAL	<u>7,168</u>

During this reporting period 13 Michoud Operations Notices and 22 Michoud Operations Instructions were published.

Ad Hoc Committees, chaired by NASA Administration Office personnel and composed of representatives from each of the prime contractors, were appointed to study particular problems in the fields of communications and administrative and office supplies. This method proved to be successful in handling controversial problem areas, and resulted in joint development and agreement on operating procedures and specific delineation of responsibilities under the several contracts with prime contractors. Follow-up action to ensure full implementation of these procedures is currently in progress.

Reproduction

Authorization for establishment of a field printing plant at Michoud Operations was received from JCP by letter to the General Manager, Michoud Operations dated May 15, 1963. Subject: Authorization No. 21674. The Manager of the Support Operations Office was subsequently designated Printing Control Officer for the Michoud Operations Field Printing Plant.

Administrative Services

A files survey was conducted in March of 1963 leading to the establishment of central administrative files and central technical document files. Conversion of files from individual offices is well under way, and the program has been further aided by the publication of procedures and the successful completion of a 9-hour records administration class by all Michoud Operations personnel concerned with files.

Safety

The safety function was assigned to Administration & Support Office April 1, 1963.

Definite improvements have been made in automobile parking and traffic safety conditions. Additional land has been cleared and improved for safe accommodation of private vehicles. Plant guards (commissioned by the City of New Orleans) are now controlling and directing traffic which has greatly reduced potential accident hazards.

Security

Plans were made and preliminary security measures were taken to prepare for the installation of a cryptographic facility at Michoud Operations.

Assistance was rendered to Mississippi Test Operations by issuing NASA Identification Cards, MSFC identification badges and vehicle registration decals to Mississippi Test Operations personnel.

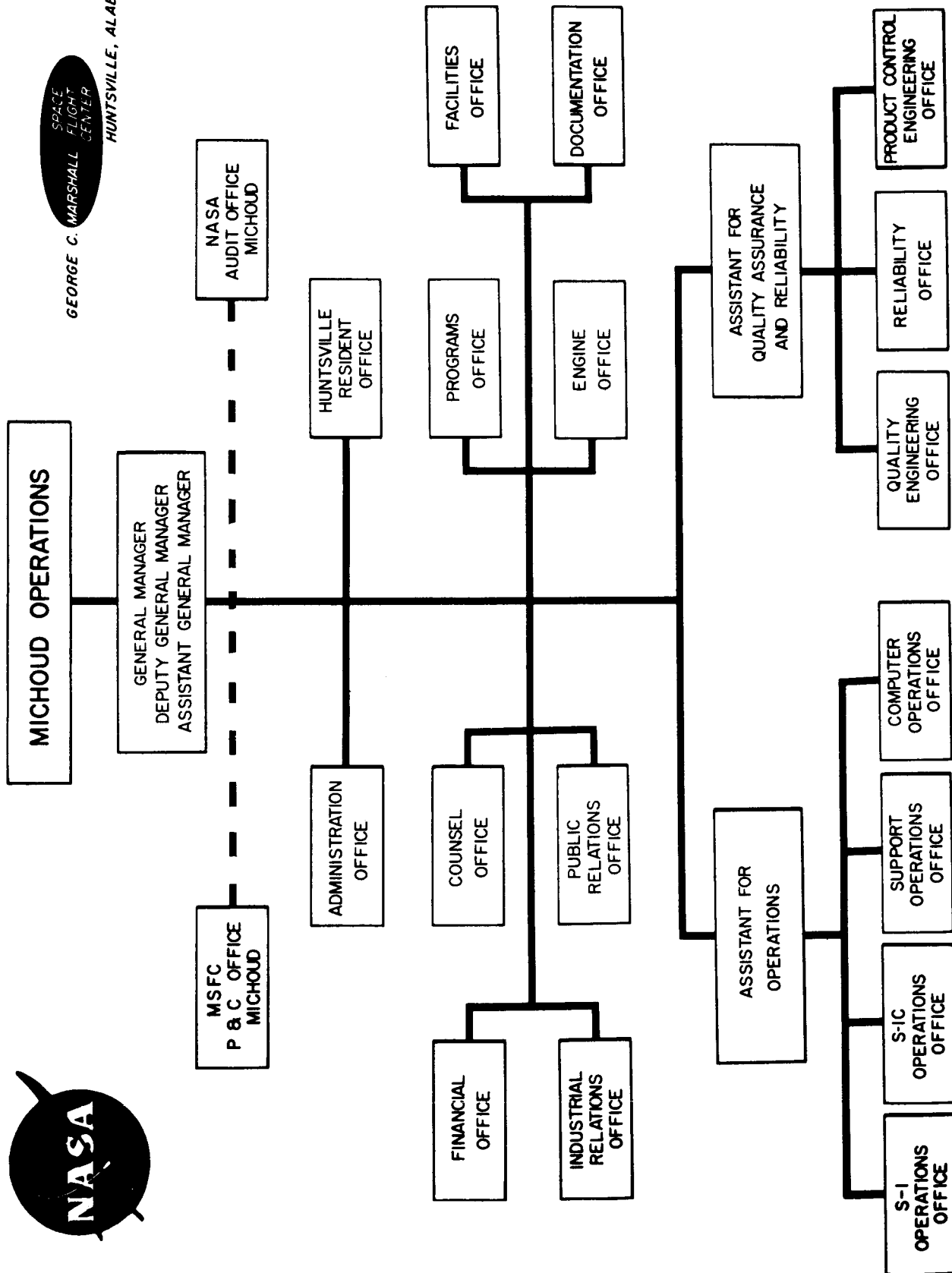
A classified custodian training program for NASA personnel was placed into effect. In addition, a procedure was established whereby all new employees would receive a security briefing at the time of their initial processing.

Transportation

On April 18, 1963, a barge 235 feet long by 40 feet wide was received for use by The Boeing Company for transportation of Y-rings and other stage components between Michoud and Huntsville.



GEORGE C. MARSHALL
SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA



QUALITY ASSURANCE AND RELIABILITY OFFICE

CHAPTER II - QUALITY ASSURANCE

The Quality Assurance organization has increased its complement of personnel from 53, as of December 31, 1962, to the present 114 on board as of June 30, 1963. This increase is credited to the expanding demands generated from the rapid pace set by the Michoud contractors in performance of their contractual requirements.

To assure contractor conformance to the contractual requirements and for coordinating, implementing and correlating changes to these requirements an organizational change was incorporated to include an office for reliability.

To extend the utilization and availability of Quality Assurance personnel, the operational functions of the Reliability Office were defined in such a manner that various specialists from the Quality Engineering and Product Control Engineering Offices assisted effectively in establishing this office. By coordination and close cooperation between other Michoud elements, the Reliability Office has been effective in monitoring the contractors reliability programs. The initial function of this office encompassed the implementation of the MSFC acceptable math model in other programs, in addition to the Chrysler Corporation Space Division program.

One of the many important tasks accomplished during the past six months was to assure that the contractors were procuring articles that conform to the specification limits, applicable drawings and revisions, assigned quality requirements and the latest released MSFC documentation

relative to the fabrication and assembly of the vehicles S-1 and S-1C.

To accomplish this important function, detailed reviews and evaluations of the contractor's procurement documents were continuously in effect. Surveys were conducted at the many subcontractor's plants to acquaint them with NASA publications, interpretations and quality requirements. These surveys have proved fruitful as articles received in-house have indicated an increase in quality with less rejects noted.

Quality Assurance personnel have reviewed, evaluated, and assisted the contractors in implementing, revising, and when necessary up-dating their training programs and schooling for qualifying their personnel in special processes.

Problems of critical nature have been encountered that are relative to the fabrication of the vehicles and their ultimate performance in the final systems test and checkout area.

In the manufacturing of tubing flares by Chrysler Corporation Space Division, it was found that an excessive percentage of production flares could not meet the required (MSFC-testing standard MC-146) specification. Extensive statistical calculations were performed to determine the ability of Chrysler Corporation Space Division to conform to this standard, but the resulting tube flare samples submitted did not pass. Certain tolerances were relaxed to allow Chrysler to continue tube assembly production and as of this date, no problems have been encountered.

A problem has recently developed in an area where the contractors are procuring items to advance documentation. The use of advanced drawings

and Engineering Change Proposals for procurement and manufacturing action was authorized on the basis of a letter from the Saturn Systems Office. Chrysler Corporation Space Division has released Engineering Change Proposals against these drawings prior to receiving approval of the Engineering Change Proposals, and in many cases, the proposals have been rejected. This has caused extensive reviewing and detail checking by Quality Assurance as Chrysler Corporation Space Division continues fabricating and processing the material pending MSFC approval or disapproval of the Engineering Change Proposals.

Quality Assurance personnel have participated in the inspection and test operations performed by the Michoud contractors during receiving inspection, sub-assembly, assembly, component testing and engine check-out. This participation has served two main purposes; (1) To assure that items produced are of acceptable quality level and (2) to assist the contractors in maintaining an acceptable quality level and schedule.

The recently completed Quality Assurance Operations Procedures are in effect throughout all assigned areas in-house and have been found to be adequate and satisfactory.

CONTRACT AND FINANCIAL MANAGEMENT OFFICE

CHAPTER III: CONTRACT AND FINANCIAL MANAGEMENT

Contract Administration Office

Contract Branch

Mason-Rust Support Services Contractor

Modifications Nos. 17 through 23 to Contract NAS8-4004 covered incremental funding. Modification No. 24 issued and provided for the periodic substitution of wage determinations as issued by the Secretary of Labor, and also included in the definition of Michoud Facility that portion of the Army/Michoud Storage Area as set forth in the Use Agreement executed by the Department of the Army and NASA.

Modification Nos. 25 and 26 covered incremental funding. On March 5, 1963, Modification No. 27 was issued adding the responsibility for operating a general supply service in support of the Slidell Computer Office to Mason-Rust's other supply responsibilities. This modification also revised the Small Business Sub-contracting Clause and added a Contractor and Sub-contractor Cost or Pricing Data Clause to the General Provisions.

Modification Nos. 28, 29, 30, 31, 32, 33, 34, 35, 36, 38 and 39 covered incremental funding. Modification No. 37 increased the estimated cost of the contract by \$993,149 exclusive of fee. Modification No. 40, issued June 25, 1963, extended the construction and management services being furnished under Appendix "P" through December 31, 1963. This modification increased the estimated cost of the contract by \$130,500 including fee. All other functions of Contract NAS8-4004 expired as of midnight June 30, 1963.

The estimated cost of Contract NAS8-4004 is \$17,444,348 including a fixed fee of \$352,235. Modification Nos. 41 and 42 deleted and added projects to Appendix "J" - no funds involved. Modification Nos. 43 and 44, issued June 25 and June 28, respectively, covered reprogramming of funds and incremental funding.

The Mason-Rust Facility Contract NAS8-4019(F) was awarded on July 18, 1962, and funded for \$474,855. To date, 13 modifications to the contract have been issued, adding or deleting various quantities and types of equipment to Schedule "A" of the contract. The contract is currently funded for a total value of \$668,683. In addition, \$786,842 has been acquired as Government Furnished Equipment through Government Reserve.

Chrysler Corporation Space Division - S-I Stage Contractor

Contract NAS8-4016, which was awarded July 27, 1962, continued in effect. Principal modifications to the contract during this reporting period incorporated a Reliability Program for the Saturn I, S-I Stage, increased the estimated cost of plant modifications to \$5,006,270 added an Aeroballistics Program, and incorporated 301 Documentation Change Directives.

Negotiations are presently in progress to change the contract to delete 12 S-I stages and add 12 S-IB stages.

Facilities Contract NAS8-5602(F) was fully funded in the amount of \$7,139,819. In addition to this amount, Chrysler has received as Government Furnished Equipment from Government Industrial Reserves, equipment estimated at \$4,255,423.

The Boeing Company - S-IC Stage Contractor

The Boeing Company was awarded supply Contract NAS8-5608 on January 1, 1963, for the furnishing of 10 Saturn S-IC Stage Boosters. The estimated cost of this contract was \$418,820,967. Negotiations are presently being conducted on 17 changes and a revised program schedule. Through this reporting period, the contract has been funded for a total of \$66,022,765. Nineteen modifications have been issued covering incremental funding and substitutions in various parts of the work statement.

Facilities Contract NAS8-5606(F) has been funded in the amount of \$7,779,471. This amount does not include Government Furnished Equipment received by Boeing through May 30, 1963 at an estimated cost of \$3,151,938.

Property Branch

During this reporting period a survey was made of the real and installed property at Michoud Operations and the Slidell Computer Office and records established in accordance with NASA Real Property Procedures. The Property Disposal Review Board was established, and disposal action amounting to \$2,797,504 was accomplished during this period. Of this amount, \$2,136,225 was the value of the foundry equipment disposed of in order to utilize the Foundry Building.

Financial Management Office

Depository for Cash Receipts

A bank account was established by the Treasury Department at the Michoud Branch of the National Bank of Commerce for the purpose of depositing cash received by the Cashier.

Certification of Vouchers to the Regional Disbursing Officer

During the period, arrangements were made to send vouchers directly to the Regional Disbursing Officer in Birmingham, Alabama.

Certification of Funds

Authority to certify funds was implemented in January of 1963 for all procurement requests preceding issuance of contract modifications.

Certification of Vouchers on Construction Contracts

Contracts for construction at the Michoud complex were transferred from MSFC to Michoud, and certification of vouchers on construction contracts was inaugurated.

Packaging, Crating, and Handling Costs

A procedure was established for recording, controlling, and paying the packaging, crating, and handling costs on Government surplus property and industrial reserve equipment that is requisitioned for use in the Michoud plant.

Surveys of Construction Contractors' Operations

An extensive review was performed of the operations of contractors doing construction at the Michoud plant. The review included examination of payrolls, on-site observations, and personal interviews with employees to determine compliance with the Davis-Bacon Act, the Copeland Act, and the Eight-Hour Law.

Surveys of Contractors' Systems and Procedures

Surveys and analyses of contractors' systems and procedures were performed as follows:

- a. Boeing: Reporting and Budgets Group; Material and Property

Accounting; Direct Material Analysis; Financial Systems and Procedures; Direct Labor Analysis; and Indirect Cost Controls.

b. Chrysler: Accounts Payable; Material Change Control Section; Material Stores Section; Personnel Education and Development Branch; Material Preservation and Packaging Section; Personnel Compensation and Organization Branch; and Personnel Employment Placement and Recruitment Branch.

c. Mason-Rust: The operations of Pickett Food Services, Inc, the cafeteria sub-contractor, were reviewed in considerable detail in connection with the establishment of the price structure for food sales. During the half year ending June 30, 1963, the food service operation recovered initial losses and began realizing profits in March. In accordance with the concessionaire's contract, food prices were reduced for the period starting July 1, 1963, based on a forecast of profits during the next year.

PROJECT MANAGEMENT OFFICE

CHAPTER IV: PROJECT MANAGEMENT

Scheduling and Resources Office

Saturn I/IB, S-I/IB Program

The Chrysler Corporation Space Division Contract NAS8-4016 was modified and increased in value during this report period in the amount of \$6,427,512. This increased the total contract value from \$219,451,499 to \$225,888,793.

Fiscal year 1963 funding is as follows:

Contract NAS8-4016 - Total of \$65,128,824 which includes \$5,006,270 C of F for Plant Modification and \$185,160 C of F for Design of Facility Modification.

Contract NAS8-5602(F) - Total contract value of \$7,139,819.

A fiscal year 1964 Saturn I/IB, S-I/IB Program was prepared during this report period. It is estimated that approximately \$115,000,000 will be required during this fiscal year for Contract NAS8-4016. It is also estimated that an additional requirement of \$3,279,631 for facility equipment for Contract NAS8-5602(F) will be required.

Saturn V, S-IC Program

The Boeing Company definitive (long term) Contract NAS8-5608 was effective January 1, 1963 at an initial value of \$418,820,967 (including \$13,345,060 C of F) for supplies and services.

Contract NAS8-5608 was subsequently modified and increased to a value of \$419,568,451. The increased value provided \$539,734 for increased effort of Systems Support and \$207,750 for increased effort in the Quality Assurance Program.

Contract NAS8-5608 was modified on May 3, 1963. The major impact of this modification affected Item I of the contract by reducing the deliverable stages to one S-IC-F Systems Checkout Stage and nine S-IC Flight Stages. Stage delivery schedule of the first item (S-IC-F) was delayed 11 months and the last item (S-IC-10) six months. This particular program is commonly referred to as Plan V.

The Boeing Company Contract NAS8-5606(F) for facilities equipment to support the S-IC program was extended through June 30, 1963, and increased by \$43,100 to a revised contract total of \$7,779,471.

Fiscal year 1963 funding is as follows:

Contract NAS8-5608 - Total of \$68,317,765 which includes \$10,281,440 C of F.

Contract NAS8-5606(F) - Total contract value of \$7,779,471.

A fiscal year 1964 Saturn V, S-IC Program was prepared during this report period. It is estimated that approximately \$171,600,000 will be required for Contract NAS8-5608. It is also estimated that \$12,201,000 for additional facility equipment for Contract NAS8-5606(F) will be required.

Support Services

On January 8, 1963, Telecomputing Services, Inc and NASA entered into Contract NAS8-5614 with a contract value of \$478,683 for operation of the Michoud Computer Office at Slidell, La. Period of performance was one year. This contract was subsequently increased in value by \$56,035 (providing engineering and technical services to maintain analog computer at Michoud Operations) to a contract value of \$534,718. Fiscal year 1963 funding of this contract was \$290,000.

Pert

Chrysler Corporation Space Division/MSFC PERT Implementation Team activities continued during this reporting period. CCSD implemented PERT networks on vehicles S-I-8, S-I-10 and S-I-111 and is reporting bi-weekly on these networks. A CCSD Plant Modification Network and bi-weekly reporting was also implemented. A Milestone (composite) network of the 20 vehicle program, including tooling, manufacturing area, testing and transportation constraints was implemented and bi-weekly reporting commenced June 14, 1963. This PERT network is a significant step in S-I PERT Implementation, in that we now have total program status. A CCSD Reliability Program PERT network was implemented and bi-weekly reporting commenced on June 20, 1963. The S-I Work Breakdown Structure and CCSD Subdivision of Work Definitions for S-I were finalized during this report period. The major remaining PERT activity to be implemented is the design and engineering effort associated with the S-IB program. This will be accomplished on completion of successful contract negotiations of the S-IB effort. The CCSD PERT effort is on schedule and the resulting data is providing management with current and future schedule condition.

The Boeing Company/MSFC PERT Implementation Team was established during this reporting period. A S-IC Work Breakdown Structure for PERT and Financial Reporting was finalized on March 19, 1963. Boeing PERT networks and bi-weekly reporting has been implemented for Stage Structures, Propulsion, Electrical, Flight Control, Instrumentation, Stage Assembly,

Transportation, Stage Test and Facilities. PERT Networks on GSE and MSE are in preparation and are scheduled to be implemented by mid - July 1963.

Quarterly Reviews

Two Quarterly Reviews were held among Chrysler Corporation Space Division and the Michoud/MSFC Divisions. Both reviews were held at New Orleans. Two Quarterly Reviews were held with The Boeing Company, one at New Orleans and one at Huntsville.

Transfer of Program Authority and Fund Certification

At the beginning of the third quarter of FY 63, MSFC delegated authority to Michoud Operations for initiation of programming documents using program authority and fund certification as issued to Michoud by the Financial Management Office of Marshall. This action provides expeditious initiation of contractual actions, inasmuch as the Marshall Procurement and Contracting Division was simultaneously established at Michoud.

Facilities and Equipment Office

During this period NASA, through Mason-Rust, under Contract NAS8-4004, completed a total of eleven construction contracts valued at \$4,657,126. Following is a list of these completed projects:

Truss modification, Phase I, value \$167,148, was completed in February.

Shipping and Receiving Docks, value \$246,726, completed in February.

Vertical Assembly and Hydrostatic Test Facility, Phase I, value \$1,525,000, completed in April.

Modification to Plant Facilities, value \$214,880, completed in February.

Lighting and Power Distribution, value \$835,747, completed in May.

New Roof Manufacturing Building, value \$763,969, completed in March.

Cooling water, Phase II, value \$201,842.

Cooling water, Phase III, value \$157,709, both completed in April.

Installation of East Door, value \$25,990, completed in February.

Computer Facility, Phase II, value \$219,488, completed in March.

Dehumidification, Manufacturing Plant, value \$298,627, completed in April.

S-I Project Office

The S-I Project Office continued to monitor, assist and coordinate technical matters with CCSD, NASA-Michoud and MSFC. Plant activation effort continued on a parallel effort with manufacturing and assembly operations. The latter part of April 1963, CCSD began clustering operations for the first Chrysler built Saturn booster (S-I-8). The clustering consisted of the tail section assembly, nine propellant tanks and the spider beam assembly. During the period, the first set (eight) of H-1 Rocketdyne engines were received at Michoud for installation on S-I-8.

S-IC Project Office

The S-IC production buildup is continuing. The 40-foot boring mill has already been used to fabricate the first five Y-rings, a 2-ton structural segment of stage tankage. Plant construction and modification

are proceeding on schedule. By early 1964, the S-IC portion of the plant should be activated. Tooling is now being procured.

The major construction effort is the Vertical Assembly Building. This structure, over 200 feet high, will, when finished this year, be used to assemble and hydrostatically test S-IC stages.

In the area of technical review of procurement action, approximately \$7,700,000 in facilities equipment was reviewed and approved by this office. An additional \$22,200,000 in flight hardware procurement has been reviewed and approved.

Vehicle Systems Engineering Office

The transfer of documentation from the Marshall Space Flight Center was completed March of 1963 for Stages SA-8 and SA-10. This documentation is now being maintained by Chrysler for those stages as well as for Stages SA-111 and Subsequent; and changes are being implemented for the S-IB Stages as required. The documentation release status since implementation of the program was 49,352 items; of this total 23,896 were released during this reporting period.

The Boeing Company started preparing and releasing documentation, the results of their releases are 2,757 documents. Virtually all of these documents were of the structural design area. As of this date the structural release is approximately 75 percent completed and should be finalized within the next reporting period.

COMPUTER OFFICE

CHAPTER V: COMPUTER OFFICE

Four PACE 231-R Analog Computers were procured and installed at the Computer Office in March 1963. These computers are available for use by NASA and all contractors. Scheduling and technical supervision of the computer operations is a NASA responsibility. Maintenance of the computers is a function of TSI under Contract NAS8-5614. The Chrysler Corporation Space Division initiated action to procure an additional PACE 231-R analog computer for installation at the Michoud plant. It is planned that this computer be transferred to NASA property accounts after installation and checkout. This computer will be considered as part of the analog complex at the Computer Office. Users of the analog equipment to date are Boeing, Chrysler and Computation Division, MSFC.

A card transceiver (slow speed) data transmission system was installed in June 1963 to provide NASA and contractors at Michoud Operations transmission capability among Slidell, Michoud, Baronne Building and Claiborne Towers (New Orleans), Seattle, Detroit, Huntsville and Mississippi Test Operations. Action has been initiated to select and install a high-speed (15,000 characters per second transmission rate) data transmission system between the Computer Office at Slidell and the Baronne Building, New Orleans. This system will relieve the problem of transporting data between New Orleans and Slidell by automobile and will provide fast access to computers. The system will also provide printing, card punching and data editing capability at the Baronne Building site. This data transmission equipment is scheduled to be installed in October, 1963.

VIII

MISSISSIPPI TEST OPERATIONS - HISTORICAL REPORT

January 1 - June 30, 1963

MISSISSIPPI TEST OPERATIONS - HISTORICAL REPORT

January 1 - June 30, 1963

The National Aeronautics and Space Administration (NASA) is establishing the Mississippi Test Operations (MTO) in Hancock County, Mississippi, as a centralized facility for static testing the huge rocket stages and engines required to launch Apollo lunar vehicles. Rocket stages assembled at the Michoud Operations in New Orleans, Louisiana, and development and production facilities in Seal Beach, California, will be static fired at MTO before being shipped to the Atlantic Missile Range (AMR) for launching. At the beginning of this report period NASA's plans included test facilities for the S-I stage of Saturn I, the S-IC and S-II stages of Saturn V, and the F-1 engine of the S-IC stage.

MTO, which is a part of the Marshall Space Flight Center (MSFC), is located about 40 miles northeast of New Orleans and consists of a 25-square-mile fee area and a 200-square-mile buffer area.¹ All testing and support activities will be done in the fee area and, with the exception of fire department personnel, no one will live in this area. People will be permitted to work, but not to live, in the surrounding buffer area. The buffer area will provide a safety zone for dissipating the loud, low-frequency sound waves coming from the test site.

1. For a description of the fee and buffer areas, see MSFC Historical Office, Historical Origins of the Mississippi Test Facility, contained in Volume II of the History of the George C. Marshall Space Flight Center, July 1 - December 31, 1962 (MHM-6).

Initial development, from selection of the site in October 1961 through December 1962, included land acquisition, planning for site preparation, and design studies. MSFC selected the architect-engineering firm of Sverdrup and Parcel and Associates of St. Louis, Missouri, to provide design criteria and master planning. The U. S. Army Corps of Engineers, Mobile District, under MSFC direction, will make all detailed designs of facilities except for technical systems.

MSFC's architect-engineering (A-E) contract with Sverdrup and Parcel was modified early in this report period to provide for additional conceptual/feasibility studies, development of revised site plans, expansion of support facilities criteria, and completion of criteria for the S-IC and S-II test facilities.²

In June 1963 MSFC officially designated the Mississippi site as Mississippi Test Operations rather than Mississippi Test Facility (MTF), the name by which it had been known pending selection of the official title.³

Management and Administration

MTO became active during early 1963 under Captain William C. Fortune, USN, as project manager. MSFC assigned technical and clerical personnel to temporary headquarters at the site on March 10, 1963. As of June 30,

2. MSFC Test Division, Test Division Progress Report, December 12, 1962 - January 12, 1963.

3. Joseph H. Reed, Chief, Management Analysis Office, MSFC, to Distribution, (memo), subj., "Change 50, MSFC Organization Manual." June 11, 1963.

MSFC had stationed 24 personnel at the site and had four personnel⁴ serving in a liaison capacity at MSFC.

In December 1962 MSFC had established a Planning Board to govern the activation of the facility and on January 4, 1963, MSFC established the MTF Working Group to implement the decisions of the Planning Board. The Working Group is located at MSFC and is composed of personnel from the Test Division and Facilities Engineering Office with support from⁵ the stage contractors and Sverdrup and Parcel. The primary functions of this group are to coordinate the efforts of MSFC elements, other government agencies, and contractors participating in MTO planning, design, construction, and checkout; to determine problem areas beyond the scope of the Working Group; and to propose solutions or courses of action to the MTO Planning Board.

MTO will be managed by civilian personnel of NASA who will be responsible for contract administration and technical monitorship of the stage and support service contractors. Present plans call for testing of the S-IC booster and the S-II stage by the contractors, Boeing Company and the Space and Information Systems Division of North American Aviation, Inc., respectively.

4. MSFC Mississippi Test Facility Working Group, NASA - MSFC Historical Report, Mississippi Test Facility, August 4, 1961 - June 30, 1963, p. 9. Hereafter cited as MSFC MTF Working Group, Historical Report, MTF, August 4, 1961 - June 30, 1963.

5. MSFC Historical Office, History of the George C. Marshall Space Flight Center, July 1 - December 31, 1962 (MHM-6), Volume II, Historical Origins of the Mississippi Test Facility, p. 10. Hereafter cited as MSFC Hist. Office, Hist. of the Geo. C. Marshall Space Flight Center (MHM-6), Volume II, Historical Origins of MTF.

NASA Headquarters announced on April 16, 1963, that the General Electric Company will provide support services to NASA and contractor personnel at MTO.

Land Acquisition

The MTO test site, scheduled to go into operation in mid-1965, is located in the western section of Hancock County, Mississippi. The buffer zone around the main complex extends into Pearl River County, Mississippi, and St. Tammany Parish, Louisiana. The entire MTO area covers approximately 141,950 acres of land. NASA estimated that land acquisition and easements would cost about \$13.5 million. The Mobile District of the U. S. Army Corps of Engineers is serving as NASA's agent for land acquisition in cooperation with the Lands Division of the Department of Justice.

At the beginning of this report period the Mobile District Corps of Engineers had completed acquisition of the 13,424-acre test site, known as the fee area, except for a 320-acre tract for which right of entry for construction had been obtained. This 320-acre tract is part of a large tract which overlaps in the buffer zone. As this report period ended, final acquisition of this 320-acre tract was still pending.

6. MSFC MTF Working Group, Historical Report, MTF, August 4, 1961 - June 30, 1963, p. 10.

7. MSFC Hist. Office, Hist. of the Geo. C. Marshall Space Flight Center (MHM-6), Volume II, Historical Origins of MTF, p. 4.

8. NASA Mississippi Test Facility (MTF), Status of Construction Activities as of March 18, 1963.

Acquisition of restrictive easements on land in the buffer zone had continued on a progressive basis with a scheduled completion date of July 1964. In May 1963 the Corps of Engineers recommended to MSFC that the date for completion of government possession of land in the buffer area be advanced to January 1965. This delay would not affect the acquisition program but would allow each landowner a reasonable time to relocate after acquisition. The scheduled date for completion of acquisition would remain July 1964.⁹ In July 1963 MSFC concurred with the Corps of Engineers' recommendation and authorized the delay of possession of land in the buffer zone until January 1, 1965.¹⁰ At the end of this report period the Corps of Engineers had acquired appropriate easement interests in a total of 5,634 acres of land in the 128,526-acre buffer area.¹¹

Construction of Facilities

Early in May 1963 MSFC sponsored a conference among construction unions, major construction firms, and the federal government. The purpose of this meeting was to work out advance agreements on wages, hours, and working conditions. MSFC called the meeting at the request of the President's Missile Sites Labor Commission, and it was the first

9. W. E. Mussel, Chief, Real Estate Division, U. S. Army Engineer District, Mobile, Corps of Engineers, to Director, MSFC, (letter), undated.

10. Harry H. Gorman, Deputy Director for Administration, MSFC, to Col. D. A. Raymond, District Engineer, U. S. Army Engineer District, Mobile, (letter), July 8, 1963.

11. NASA MTF, Status of Construction Activities as of June 18, 1963.

such conference ever sponsored by the federal government in advance of¹²
the award of construction contracts.

MSFC assigned design and construction responsibility for all work to be done at MTO to the Mobile District, U. S. Army Corps of Engineers, except for the technical systems, instrumentation, and control, which will be done by MSFC. Value of the work assigned to the Corps is \$52 million under the Fiscal Year 1963 program and \$78 million under the¹³
Fiscal Year 1964 program, a total of \$130 million.

Test Facilities

MSFC planned to construct the facilities at MTO in three major increments. The first phase of construction, scheduled for completion in mid-1965, will include the Saturn V lunar rocket test complex. The Saturn V complex will include one dual-position test stand for the 7.5-million-pound-thrust S-IC booster stage and a test control center; two single-position test stands for the S-II second stage of Saturn V with test control center; a data acquisition facility and a data handling center; a central control center; and adjacent canals, docks, utilities, and roadways. The entire complex will cover about 850 acres and involve¹⁴
an estimated construction cost of \$65 million.

12. MSFC Public Information Office (PIO), Press Release, April 28, 1963.

13. T. J. Hayes, Brig. Gen., Department of the Army, to John C. Stennis, U. S. Senate, (letter), April 17, 1963.

14. NASA MTF, Status of Construction Activities as of March 18, 1963.

In January 1963 NASA transferred \$17,328,000 of Fiscal Year 1963 research, development, and operations funds to the Fiscal Year 1963 construction of facilities appropriation to initiate construction of the first increment of test facilities for the S-II stage. This first increment will constitute about 30 per cent of the total S-II stage facilities. Transfer of these funds was necessary to enable NASA to meet the February 1965 scheduled date on which static firing of the S-II is to begin.

During March 1963 the Corps of Engineers awarded to Sverdrup and Parcel a \$2,850,000 contract for final design of the Saturn V test complex. This contract calls for design work to be finished in 13 months; however, the design will be completed in increments, so that construction can be started prior to the completion of design. During April the Corps of Engineers awarded an A-E contract to a Mobile, Alabama, A-E firm for design of access roads to the Saturn V complex. Estimated cost of construction of the roads is \$425,000. Bids were opened on May 28 for clearing of the Saturn V complex and advance notice to advertise bids was issued on June 10 for construction of foundations for the Saturn V test stands. The approximate value of this proposed construction is \$2.5 million.

15. Hugh L. Dryden, Deputy Administrator, NASA, Report to the Committee on Science and Astronautics of the House of Representatives, Jan. 31, 1963.

16. MSFC PIO, Press Release, Mar. 1, 1963.

17. NASA MTF, Status of Construction Activities as of April 25, 1963.

18. NASA MTF, Status of Construction Activities as of June 4, 1963, and June 18, 1963.

On April 9, 1963, NASA Headquarters approved MSFC's procurement 19
plan for the technical systems of all Saturn V test facilities at MTO.
Late in this report period MSFC completed negotiations for the first
phase technical systems and awarded an \$18,254,800 contract to Aetron,
a division of Aerojet-General Corporation of Covina, California. The
contract covers a two-and-one-half-year period and will be supervised
20
by MSFC. Under this contract Aetron will design, furnish, and install
instrumentation for a control center, data acquisition facility, data
handling center, and one of the S-II test stands. The purpose of the
instrumentation system is to collect, transmit, and convert to usable
form the large volume of test data resulting from the captive firing
of rocket stages and engines.

Support Facilities and Utilities

The first support facility to go into operation at MTO was the
Atmospheric-Acoustic Facility (AAF) which has been in operation in
temporary quarters since December 1962. The AAF has as its mission
the collection of acoustic and meteorological data which is used in
the prediction of the acoustic effects of static test firing various
21
large boosters at MTO.

Greenhut Construction Co., Inc., of Pensacola, Florida,
received a \$1,727,221 contract in July 1963 for the construction of
foundations for the two S-II stage test stands at MTO. The contractor
is expected to complete this work in March 1964.

19. MSFC Test Division, Test Division Progress Report, March 12 -
April 12, 1963.

20. MSFC PIO, Press Release, July 9, 1963.

21. MSFC MTF Working Group, Historical Report, MTF, August 4, 1961
- June 30, 1963.

Other service and support facilities required at MTO will include engineering, electronics, and instrumentation laboratories, maintenance buildings, materials storage, warehouses, a telephone building, emergency services, central control, and stage storage buildings. These facilities, included in the first phase of construction, will comprise a support area which will serve all of MTO.

On March 14, 1963, MSFC signed a contract with Southern Railroad to construct a spur line from its main line located approximately six miles northwest of MTO to the southern boundary of the fee area at no cost to, or guarantee by, the government. This spur line, which will be used to transport materials into the test site, was completed in May 1963, two weeks in advance of the scheduled completion date.

Early in March 1963 NASA transferred \$2,437,000 of Fiscal Year 1963 Saturn V research, development, and operations funds to the construction of facilities appropriations. These funds will be used for construction of an Electronics, Instrumentation, and Materials Laboratory at MTO. This facility will include a photographic maintenance and processing laboratory, a video maintenance laboratory, an instrumentation repair and calibration laboratory, an electrical and electronic equipment maintenance facility, a physics laboratory, and

22. MSFC Hist. Office, Hist. of the Geo. C. Marshall Space Flight Center (MHM-6), Volume II, Historical Origins of MTF, p. 7.

23. NASA, MTF, Status of Construction Activities as of March 18, 1963; and MSFC Test Division, Test Division Progress Report, May 12 - June 12, 1963.

24. Hugh L. Dryden, Deputy Administrator, NASA, Report to the Committee on Science and Astronautics of the House of Representatives, Mar. 6, 1963.

other specialized functional areas. In June the Corps of Engineers awarded an A-E contract for design of the Electronics, Instrumentation, and Materials Laboratory to Leo A. Daly Company of New Orleans for
25
\$74,830.

The Corps of Engineers awarded two utility design contracts during March. One award went to the A-E firm of deLaureal and Moses of New Orleans for design of the central heating plant and distribution system. Estimated construction cost of this utility was \$2.5 million. The other A-E contract went to a Cincinnati, Ohio, firm for design of a
26
high-pressure water station, estimated to cost \$1.5 million to construct.

J. L. Turner and Associates of Jackson, Mississippi, completed the design for a warehouse and a site maintenance building on April 26,
27
1963. The warehouse will have about 52,000 square feet of floor area and will contain controlled environmental areas for packaging, crating, and preserving stored items. Maintenance shops will be located in the proposed 8,400-square-foot maintenance building. MSFC
28
opened bids for construction of these facilities on June 11, 1963.

On June 17 MSFC awarded a \$285,925 contract to the C&B Construction Company of Memphis, Tennessee, for construction of an Emergency

25. NASA MTF, Status of Construction Activities as of June 18, 1963.

26. MSFC PIO, Press Release, Mar. 7, 1963; and NASA MTF, Status of Construction Activities as of March 18, 1963.

27. MSFC, MTF Status Report, May 10, 1963.

28. NASA MTF, Status of Construction Activities as of June 18, 1963.

MSFC awarded the contract for construction of the warehouse, site maintenance building, and miscellaneous facilities on July 10, 1963, to Carpenter Brothers of Dallas, Texas, in the amount of \$2,163,238.

Service Building. This building will provide a facility for the operation and maintenance of fire fighting equipment and ambulance service.

Waterways and Docking Facilities

A basic factor in selection of the present test facility site was availability of waterways for transportation of the stages and engines to be ground tested at MTO. Improvement of about 15 miles of river channel and construction of about 15 miles of canals at the facility will be required to allow barges to deliver large rocket stages and engines directly to the test towers. During this report period MSFC awarded four major contracts toward development of the waterways system at MTO.

Late in March 1963 the Mobile District Corps of Engineers asked for bids for dredging a barge harbor to serve MTO. Specifications called for clearing 158 acres of land and dredging an access channel and harbor. The channel will extend from the East Pearl River into the southwest corner of the test site. It will be about a mile long and will have a bottom width of 150 feet and a depth of 13 feet. The harbor will be about 2,000 feet long, 400 feet wide, and the same
30
depth as the channel. On May 6 T. L. James and Company, Inc., of

29. NASA MTF, Status of Construction Activities as of June 18, 1963.

30. MSFC PIO, Press Release, Mar. 26, 1963.

Ruston, Louisiana, received the contract for harbor dredging at a cost
31
of \$668,340.

On May 31 MSFC awarded a \$334,924 contract to the Harders Construc-
tion Company, Inc., of Panama City, Florida, for construction of a dock
and a one-half-mile access road leading from the dock. The dock will
32
be located on the harbor to be dredged into the test facility.

MSFC opened bids on June 6 for excavation for a lock at the East
Pearl River entrance to the MTO canal system and a bascule bridge which
would span the main canal. On June 17 the American Dewatering
Corporation of Rockaway, New Jersey, received a contract in the amount
33
of \$729,571 for this work.

MSFC accepted bids on June 11 from dredging firms interested in
widening and straightening the East Pearl River. The dredging is to
start south of the former site of Gainesville, Mississippi, and proceed
downstream approximately one mile along the East Pearl River between
Hancock County and St. Tammany Parish. T. L. James and Company
34
received this contract on June 20, 1963, in the amount of \$123,720.

Funding

During the period January 1 - June 30, 1963, the total funding
for development of MTO amounted to \$52,066,896. This amount was

31. MSFC, MTF Status Report, May 10, 1963; and NASA MTF, Status
of Construction Activities as of May 17, 1963.

32. NASA MTF, Status of Construction Activities as of May 17, 1963.

33. NASA MTF, Status of Construction Activities as of June 18,
1963.

34. MSFC, MTF Design and Construction Events for Week Ending
May 17, 1963.

broken down as follows: Saturn V first stage (S-IC) test facilities, \$2,841,000; Saturn V second stage (S-II) test facilities, \$17,143,000; Saturn V second stage test facilities (support facilities), \$6,185,000; waterways and docking facilities, \$283,000; support facilities and utilities, \$25,360,885; research and development, \$187,411; and personnel and institutional support, \$66,600.

Summary

In this report period development of the Mississippi Test Operations progressed at a rapid pace. MSFC established the MTF Working Group at the Center to provide direction in the development of MTO and assigned a management staff at the site to assume charge of the operation.

The U. S. Army Corps of Engineers, under MSFC direction, completed acquisition of the major portion of the test site, and the long-awaited construction phase of development began.

Sverdrup and Parcel and Associates of St. Louis, Missouri, under a \$2,850,000 contract, began final design of the Saturn V lunar rocket test complex. This complex will be comprised of test and support facilities for static firing of the S-IC and S-II stages of Saturn V. During this period MSFC opened bids for clearing of the 850-acre Saturn V complex and for construction of the foundations for the Saturn V test stands.

35. MSFC Financial Management Office (FMO), Program Operating Plan, Fiscal Year 1963, 4th Quarter, July 10, 1963.

Late in this period the Center awarded an \$18,254,800 contract to a division of Aerojet-General Corporation for installation of technical systems.

MSFC began design and construction of four major facilities in the support area at MTO during this period and awarded two major utility design contracts.

In May 1963, following receipt of MSFC criteria, the Mobile District Corps of Engineers began work on the waterways system at MTO by awarding two contracts, one for dredging of a harbor and the other for construction of a dock and access road. Two other contracts awarded during June 1963 provided for excavation for a lock and bascule bridge and for dredging to widen and straighten the East Pearl River.

Ground testing of large rocket engines and stages at this multi-million dollar facility is scheduled to begin in mid-1965, four years following the National Aeronautics and Space Administration's selection of the site as a key installation supporting the manned space exploration program.

IX

SATURN CHRONOLOGY *

*This is a continuation of the Saturn Chronology covering the periods April 1957-October 1961 and October 1961-November 1962 contained in Volume II of the History of the George C. Marshall Space Flight Center, July 1 - December 31, 1961 (MHM-4), and in Volume II of the History of the George C. Marshall Space Flight Center, July 1 - December 31, 1962 (MHM-6). The following pages cover the period November 1962 - August 1963.

M-SAT-M-63-11
AUGUST 15, 1963

SATURN ILLUSTRATED CHRONOLOGY
APRIL 1957 - AUGUST 1963

Prepared by:
Saturn Systems Office

November - December 1962

booster simulates configuration of the booster to be used during later manned flights.

During November, Douglas awarded S-IVB subcontracts for development of the 1750-pound thrust ullage control motors and 150-pound thrust attitude control motors.

On November 8, the last S-IV Battleship test with RL10A-1 engines was completed at SACTO; eleven tests totaling 1137.6 seconds' were accomplished. The A-1 engines were then removed and installation began of RL10A-3 operational-type engines for the next phase of Battleship hot firing tests.

On November 15, negotiations between MSFC and Boeing began on the cost proposal for the long-term S-IC stage development and production contract.

On November 16, 1962, the third SATURN flight vehicle, SA-3 was successfully launched from Cape Canaveral (Fig. 117). The vehicle, carrying a full propellant load of 750,000 pounds, rose to a height of about 104 miles with a flight range of 131 statute miles. Inboard engine cut-off occurred, as planned, after 141 seconds of flight; outboard engine cut-off came eight seconds later. Project High Water was performed as a secondary mission on SA-3 as on SA-2.

At Michoud on December 13, a contract was awarded for the construction of the S-IC Hydrostatic Test and Vertical Assembly Building (Fig. 118). Also at Michoud, Chrysler Corporation began fabrication of the tenth and final R&D SATURN booster, S-I-10.

In December, design of Marshall's C-5 Dynamic Test Tower was completed; Douglas awarded a contract for fabrication of the S-IVB Battleship tank; and, at Cape Canaveral, the Corps of Engineers awarded a contract for design of the Launch Complex 39 Vertical Assembly Building (Fig. 119).

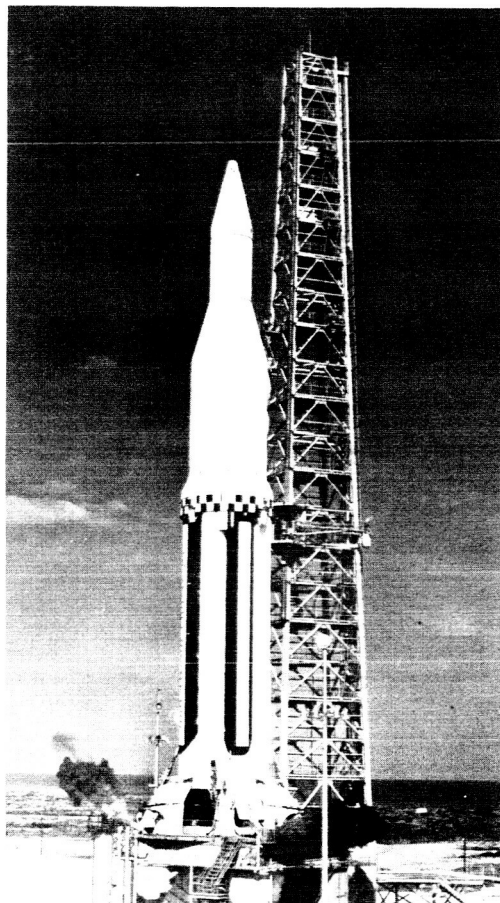


FIGURE 117. LAUNCH OF SA-3
FLIGHT VEHICLE

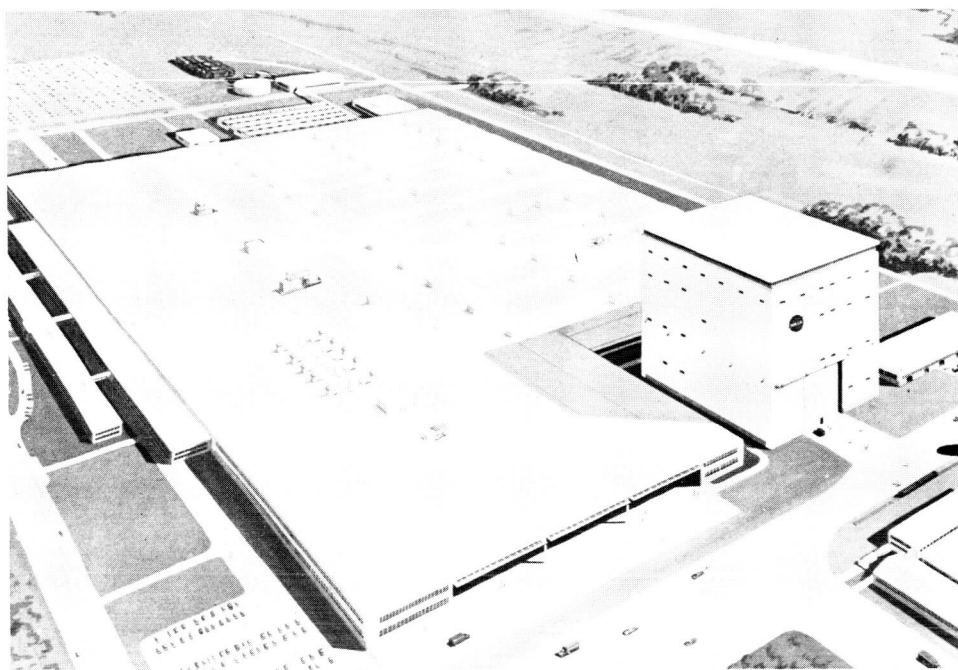


FIGURE 118. VERTICAL ASSEMBLY BUILDING AT MICHLOUD

Initial checkout of the S-IV All-Systems vehicle began at Santa Monica in late December, and fabrication of S-IV-111, the first production S-IV flight stage, was initiated.

In the latter part of 1962, an exhaustive series of tests were carried out by Rocketdyne to isolate causes of F-1 engine combustion instability, first encountered during June 1962. Additional testing with modified engine hardware was planned to continue during 1963.

During early January 1963, construction began at the Huntington Beach

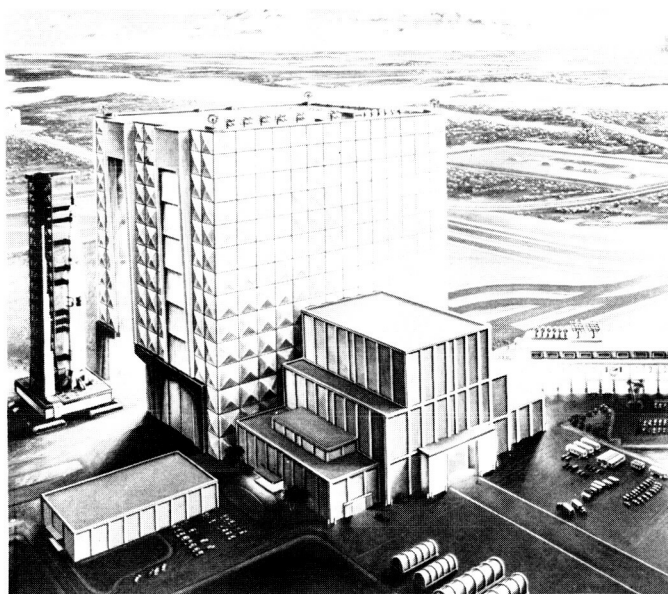


FIGURE 119. LC-39 VERTICAL ASSEMBLY BUILDING

January - February 1963

Assembly Facility, where Douglas Aircraft Corporation will assemble S-IVB stages.

On January 8, dynamic tests of SA-D5 vehicle configuration began at MSFC (Fig. 120).

On January 12, modifications were completed to the east side of the MSFC static test tower to accommodate C-1 Block II first stages. Checkout of the S-IV Dynamic/Facilities vehicle was completed at Santa Monica and, on January 18, the vehicle was barged to Cape Canaveral (Fig. 121) for use in checkout of Launch Complex 37B facilities.

The complete SA-4 vehicle was shipped from MSFC by the barge Promise on January 20, arriving at Cape Canaveral on February 2. The complete vehicle was erected on Launch Complex 34 by February 5 (Fig. 122).

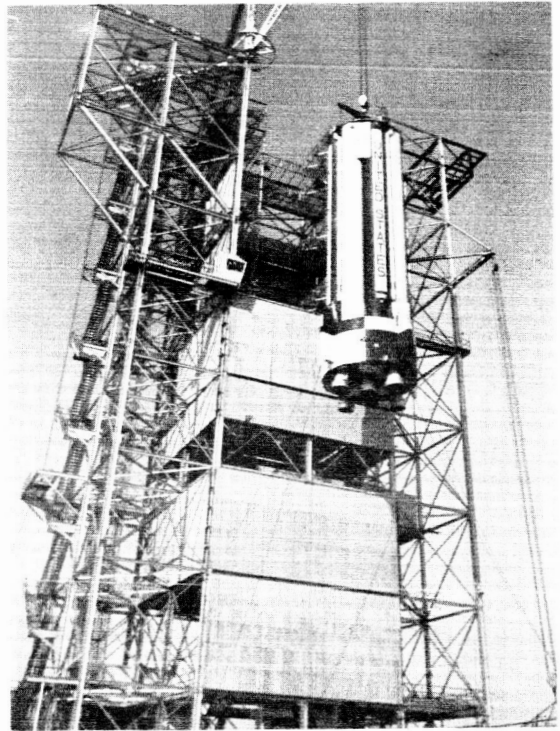


FIGURE 120. SA-D5 BOOSTER

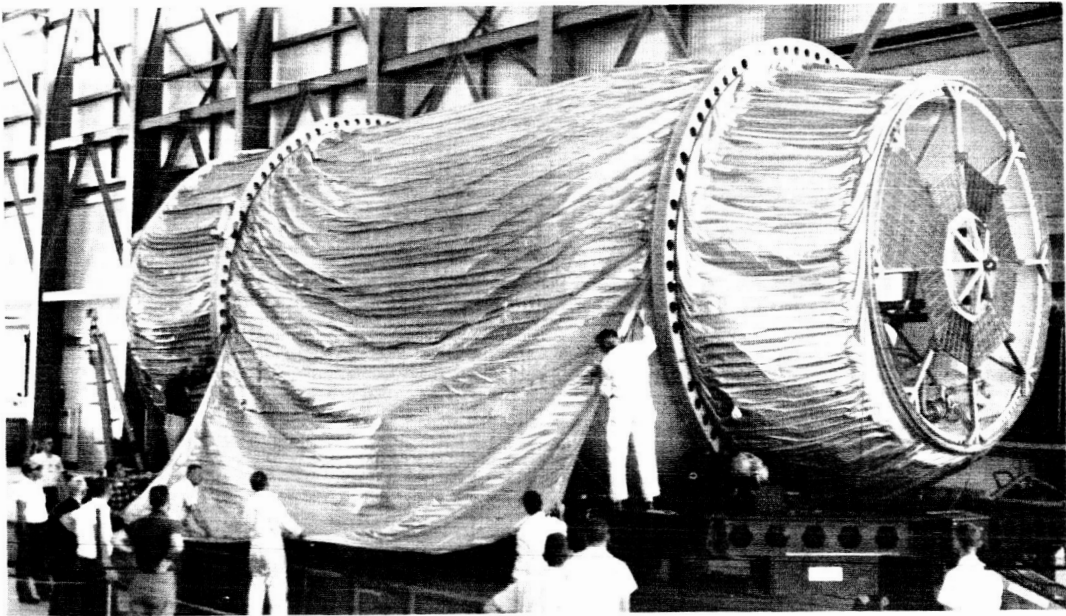


FIGURE 121. S-IV DYNAMIC/FACILITIES AT CAPE CANAVERAL

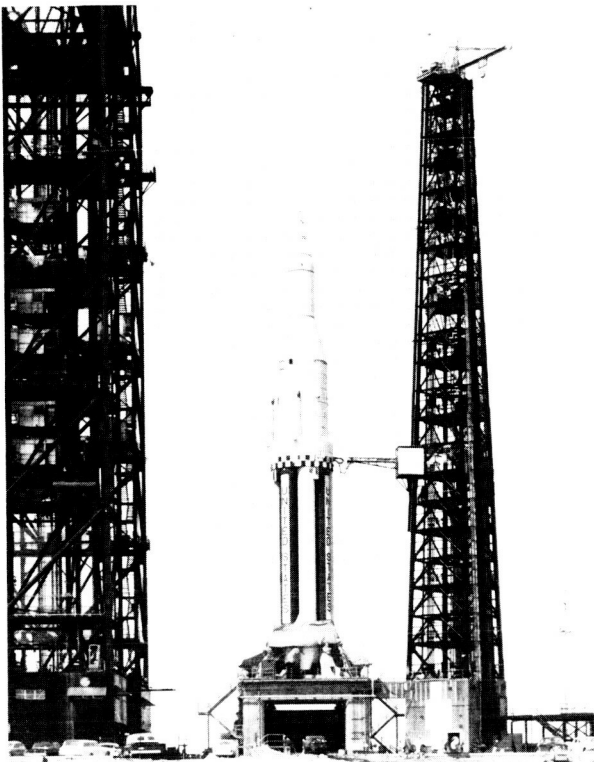


FIGURE 122. SA-4 ON LC-34

On January 26, the first hot firing of the S-IV Battleship vehicle, using RL10A-3 engines, was successfully conducted for a duration of 468 seconds.

At Launch Complex 37B, the Launch Control Center, Automatic Ground Control Station, and Umbilical Tower were completed on January 30.

On February 1, the S-IV Dynamic/Facilities vehicle arrived at Cape Canaveral for checkout of Launch Complex 37B facilities. On the same day, the S-IV All-Systems vehicle was shipped from Santa Monica to SACTO for testing.

During the first week of February, NASA Headquarters announced that Saturn vehicle nomenclature was changed from C-1 to Saturn I, C-IB to Saturn IB and C-5 to Saturn V (Fig. 123).

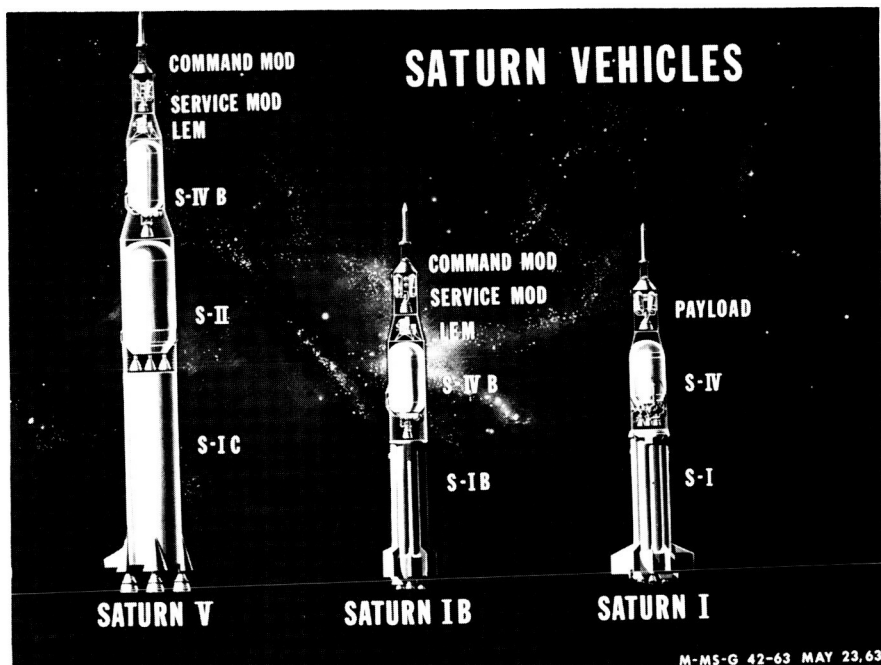


FIGURE 123. SATURN VEHICLES

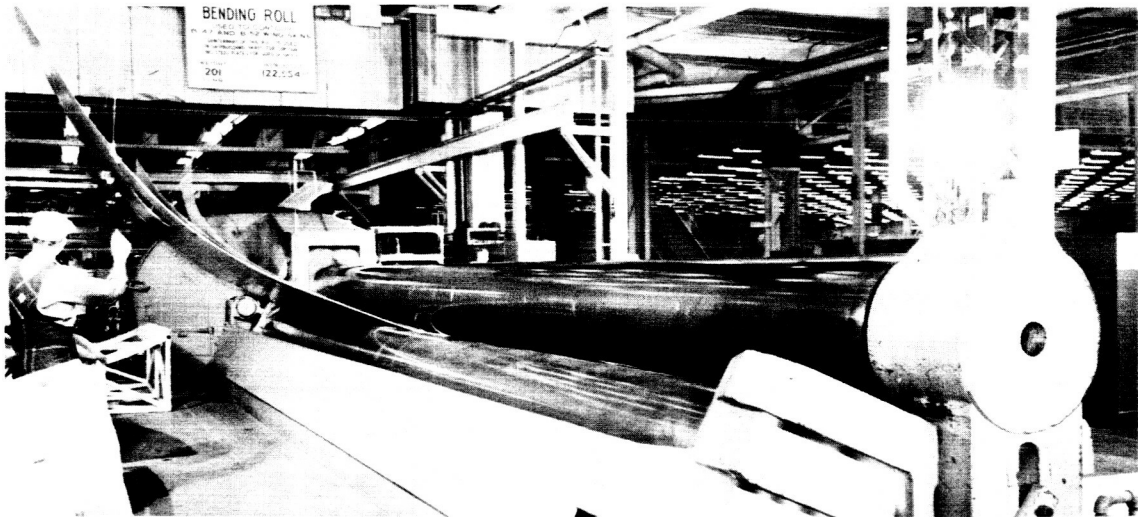


FIGURE 124. S-IC BULKHEAD GORE FORMING

In early February, Boeing began S-IC bulkhead gore-forming operations at Wichita, Kansas (Fig. 124).

On February 4, MSFC decided to modify the west side of the MSFC Static Test Tower for F-1 engine testing. The modification will allow single F-1 engine tests to begin several months earlier than scheduled. The stand will be later reconverted for S-I static testing. On February 8, MSFC awarded a contract for construction of a single F-1 engine test stand superstructure at MSFC (Fig. 125).

Early in February, S&ID began occupancy of the Seal Beach assembly and test facility (Fig. 126) where S-II stages will be assembled and tested. Also in February, S&ID successfully completed S-IC/S-II stage dual plane separation impingement tests.

On February 18 and 19, S-IV Battleship turbine spinup tests were unsuccessful due to inadequate purge procedures; however, on February 23, a successful spinup test was accomplished. Two days later, the second Battleship firing, using RL10A-3 engines

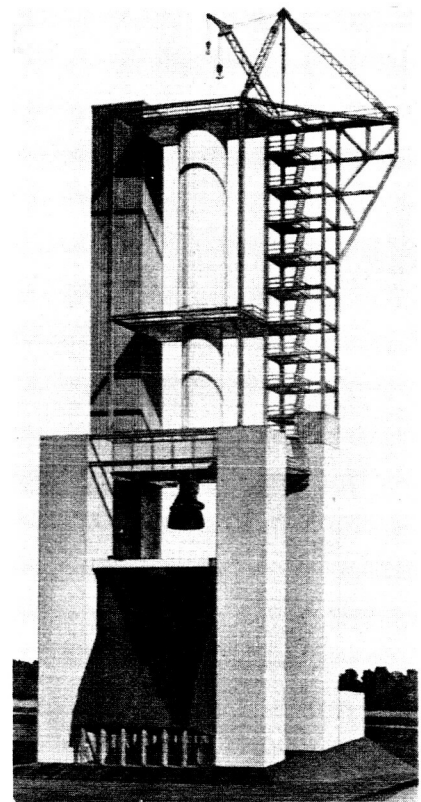


FIGURE 125. F-1 TEST STAND

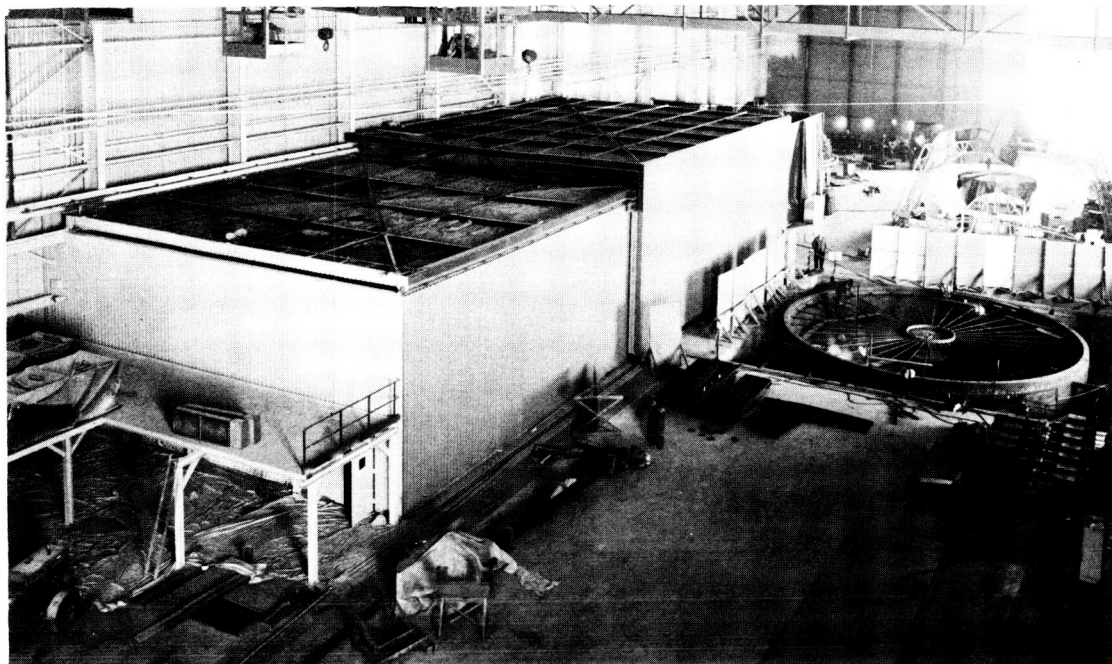


FIGURE 126. S-II SEAL BEACH FACILITY

was terminated after 6.5 seconds, when a hydrogen leak caused a fire at engine No. 4; no damage resulted.

On February 20, NASA began contract negotiations for design, fabrication, erection, and testing of the Crawler-Transporter, (Fig. 127) which will transport the Saturn V vehicle to the Launch Pad of Launch Complex 39. The contract was signed on March 29, 1963.

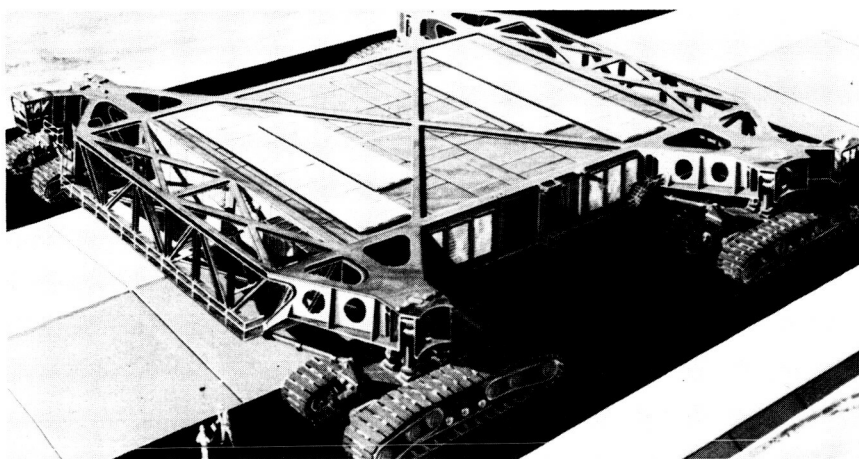


FIGURE 127. CRAWLER-TRANSPORTER

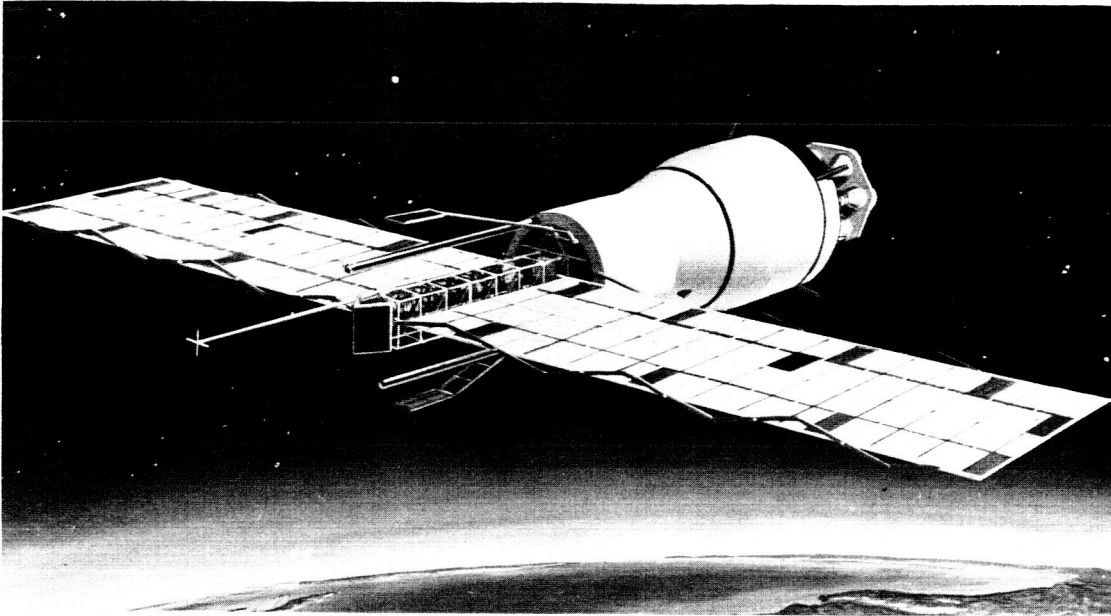


FIGURE 128. MICROMETEOROID SATELLITE

NASA Headquarters approved the procurement plan for modification of the basic Chrysler contract on February 20. The plan provides for redesign of the S-I stage to the S-IB configuration and the delivery of 12 S-IB stages and 8 S-I stages.

NASA Headquarters approved the Boeing S-IC definitive contract on February 21. Boeing will design, develop, and manufacture one ground test stage, and nine flight stages at the Michoud Plant in New Orleans.

On February 27, the Corps of Engineers awarded a design contract for the Saturn V test facilities at the Mississippi Test Operations. On the same day, MSFC awarded a contract to Fairchild Stratos Corporation to build three micrometeoroid satellites, (Fig. 128) two for flight and one for backup. The satellites, secondary payloads for

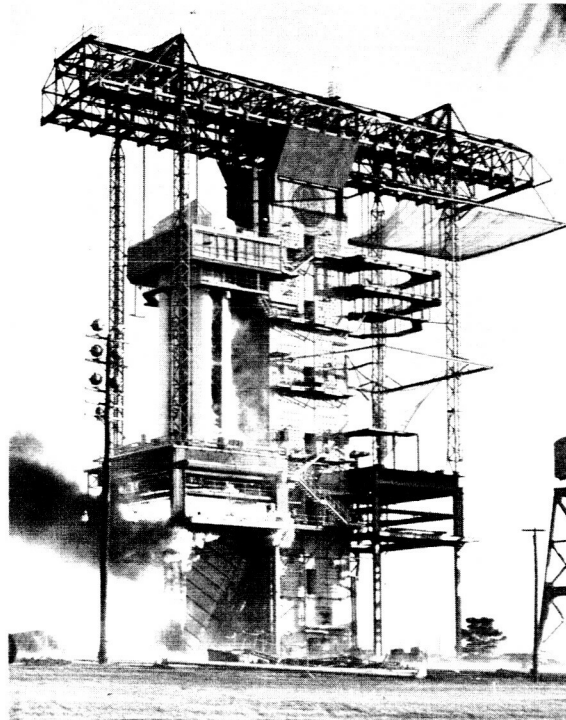


FIGURE 129. STATIC FIRING OF S-I-5

Saturn I vehicles SA-8 and SA-9, will be used to obtain data on frequency and penetration of micrometeoroids in low earth orbits and to relay the information back to earth.

On February 27, the first S-I-5 flight qualification static test (SA-11) was successfully conducted at MSFC for a planned duration of 32 seconds (Fig. 129).

On February 19, at the Michoud Plant, Boeing completed the first Y-ring (Fig. 130) for the S-IC test fuel tank; on March 4, the Y-ring was delivered to MSFC where the fuel tank will be assembled. Also at Michoud, during February, a contract was awarded for design and construction of the Engineering Building.

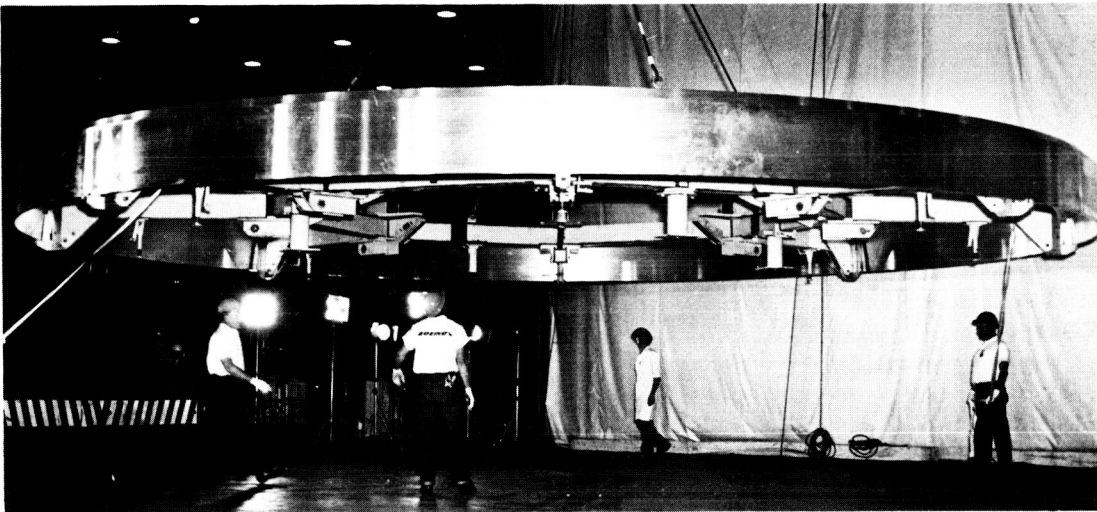


FIGURE 130. COMPLETED Y-RING AT MICHLOUD

During February, construction of Test Stand 2B at SACTO was completed and the propellant pneumatic systems were installed and checked out.

On March 1, Rocketdyne successfully gimballed an F-1 engine during a hot firing test in California. On the same day, qualification of explosive forming dies for S-II gore segments began at North American's El Toro facility (Fig. 131).

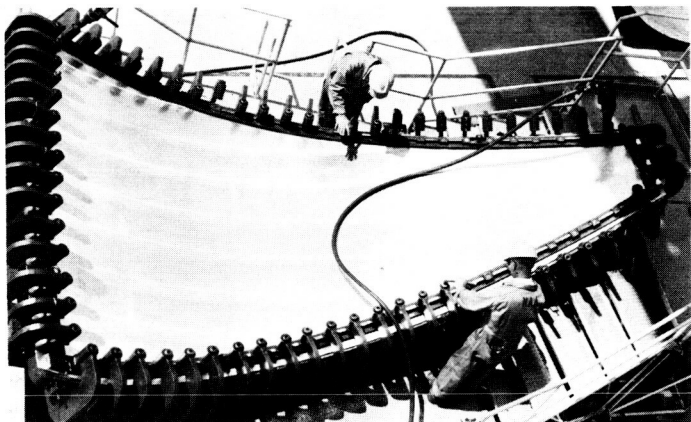


FIGURE 131. EXPLOSIVE FORMING DIES

March 1963

S&ID awarded a construction contract for the electro-mechanical mockup at Downey, California on March 1; the mockup will be used for design and engineering verification of various S-II systems.

Dynamic testing of the SA-D5 vehicle was completed on March 7. On the following day, MSFC awarded a one-year contract to industry for operation of the Slidell Computer Facility at Slidell, Louisiana.

On March 13, a second flight qualification static firing (SA-12) of S-I-5 was conducted for a planned period of 143 seconds. Subsequent analysis revealed propulsion system irregularities and a third static firing (SA-13) was conducted on March 27 to confirm corrections. This test, successfully conducted for a duration of 144 seconds, concluded S-I-5 flight qualification testing.

NASA Headquarters approved MSFC procurement plan for four additional S-IVB stages on March 22. On the same day at MSFC, checkout of the SA-5 Instrument Unit was begun (Fig. 132).

Saturn SA-4, the fourth and last of the Block I vehicles, was successfully launched on March 28

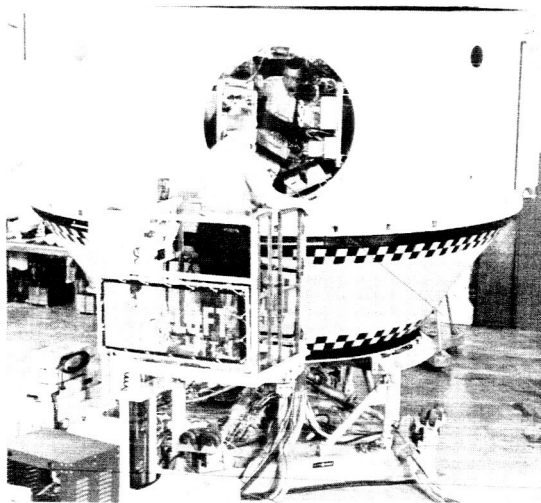


FIGURE 132. SA-5 INSTRUMENT UNIT

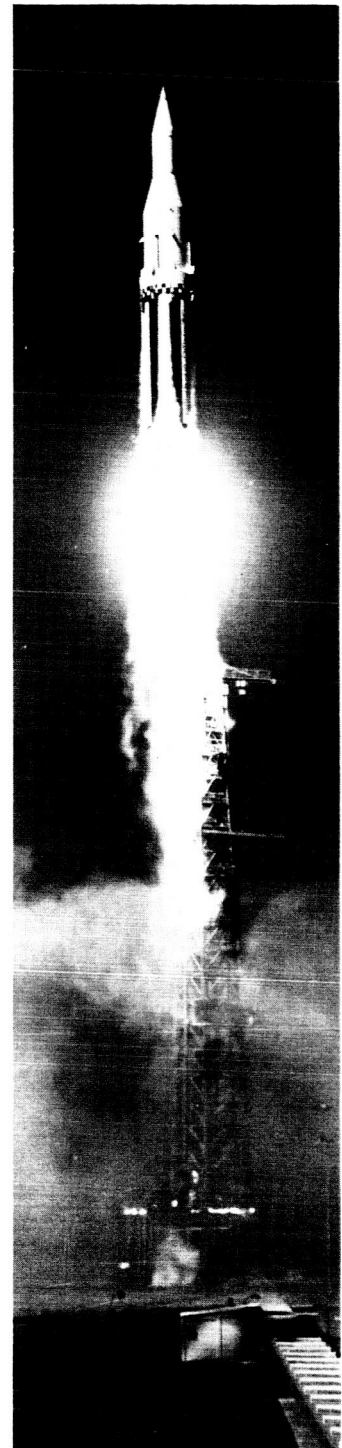


FIGURE 133.
SA-4 LAUNCH

from Launch Complex 34 (Fig. 133). The vehicle, carrying several Block II components for test, reached an altitude of 80 statute miles, range of 218 statute miles, and a peak velocity of 3660 miles per hour. As a secondary mission, the No. 5 inboard engine was cut off at 100 seconds to test the vehicle engine-out capability. Overall performance of the flight was very satisfactory.

On March 12, bids were opened for a construction contract of the Beta Complex at SACTO; the contract was awarded in late March. Also in March, S&ID placed a contract for the S-II Battleship tank structure; fabrication of components began early in April. The first S-IC cylindrical skin segment was completed by Boeing at Wichita during April.

The S-I-D5 stage was removed from the Dynamics Test Tower at MSFC on March 18. The booster was shipped to Cape Canaveral on April 5 for use in facilities checkout of Launch Complex 37B. The stage arrived at the Cape on April 15 and was erected three days later. On April 19, the S-IV Dynamics/Facilities vehicle was erected. Calibration and mechanical checks were begun the week of April 24, followed by propellant loading tests early in May (Fig. 134).

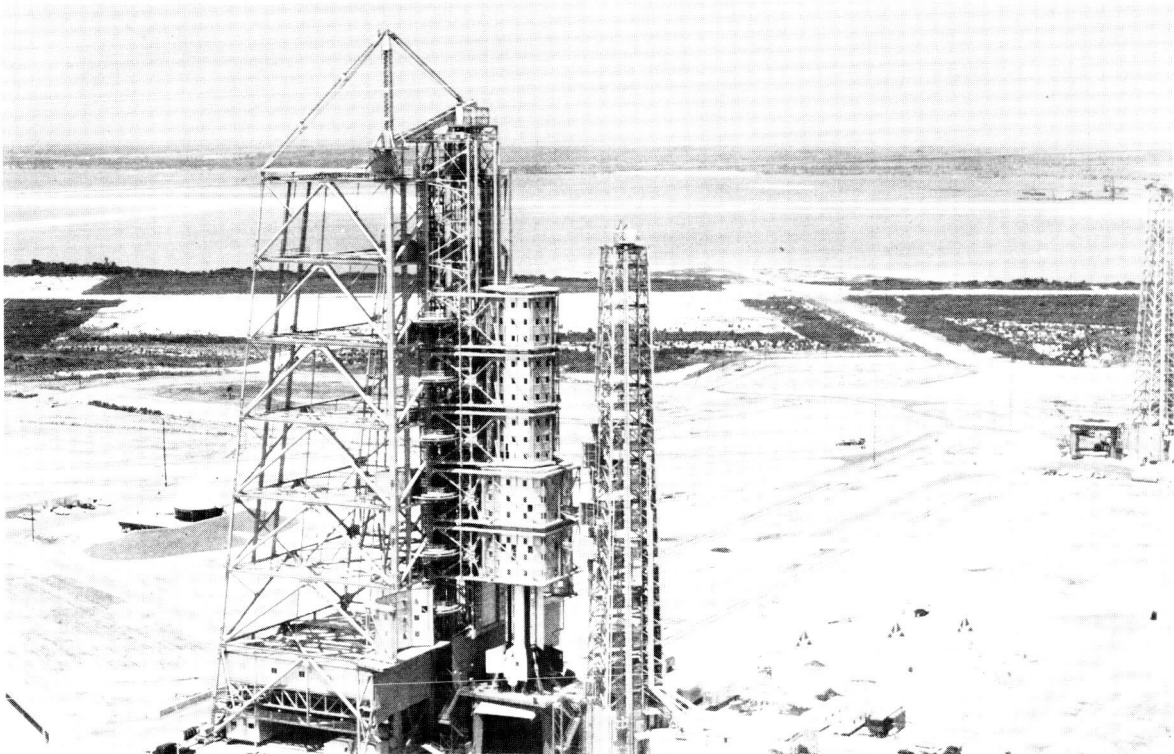


FIGURE 134. FACILITY CHECKOUT OF LAUNCH COMPLEX 37B

April - May 1963

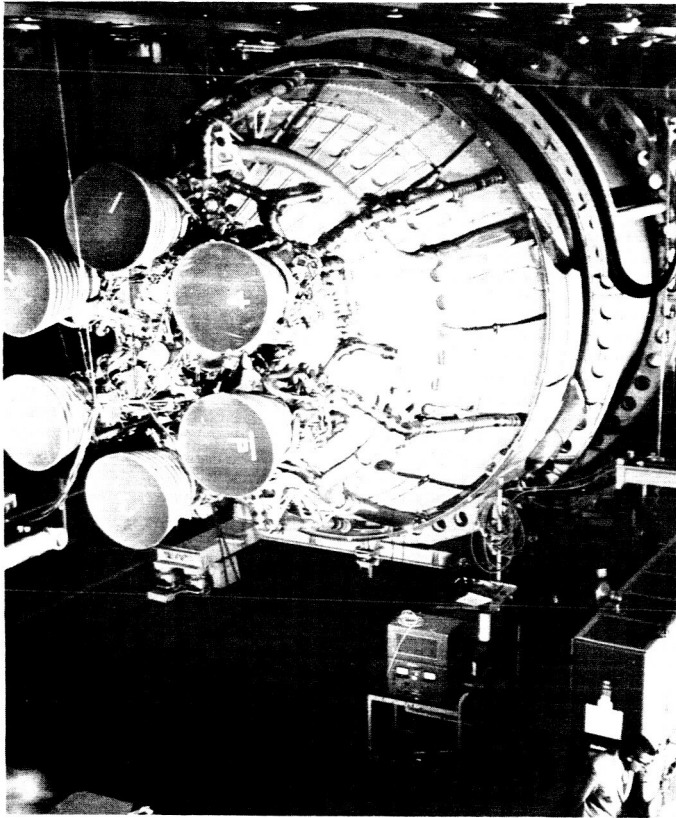


FIGURE 135. CHECKOUT OF S-IV-5

During early April, checkout of S-IV-5 was completed at Santa Monica (Fig. 135). On April 19, the stage arrived at SACTO and was installed on Test Stand 2B on May 22. Static testing would begin on completion of modifications and engineering changes.

On April 22, S-I-6 was installed in the Static Test Tower at MSFC. The first short-duration static firing (SA-14) was successfully conducted on May 15, for a duration of 33.75 seconds.

S-IV All-Systems propellant loading tests were initiated at SACTO on April 1; however, because of tank bending and insulation cracking, field repair of the tank was required. On May 14, another test was

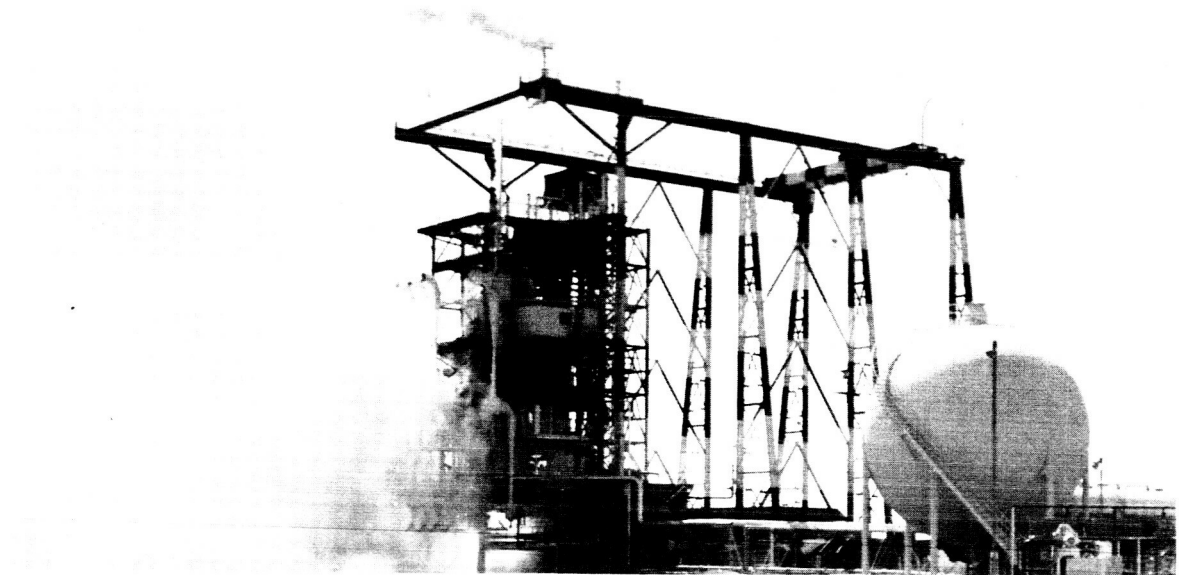


FIGURE 136. COMPLETION OF S-IV BATTLESHIP TEST PROGRAM



FIGURE 137. DOUGLAS HUNTINGTON BEACH FACILITY

performed and a hydrogen leak was detected in the common bulkhead; the vehicle was removed from Test Stand 2B for inspection and repair on May 18.

At SACTO, the S-IV Battleship Test Program was completed with a final LOX depletion firing of 444 seconds on May 4. Sixteen tests, totaling 4302.5 seconds, were accomplished using the RL10A-3 engines (Fig. 136). The complete Battleship Test Program (including both A-1 and A-3 engines) had a total firing time of 5440.1 seconds. On May 13, a one-engine gimbal test was conducted. The stage was removed from the stand on May 17. On May 21, the Battleship tank was shipped from SACTO to MSFC, arriving on July 7, where it will be used for LH₂ slosh test. Five of the six engines were shipped to MSFC; the engines will be installed on the dynamic vehicle for gimbaling tests.

During May, the S-IVB Huntington Beach fabrication and assembly building (Fig. 137) was completed and construction of the assembly tower begun. Also during May, MSFC received the S-IVB forward area mockup (Fig. 138) from Douglas to be used to determine interface requirements between the S-IVB and Instrument Unit.

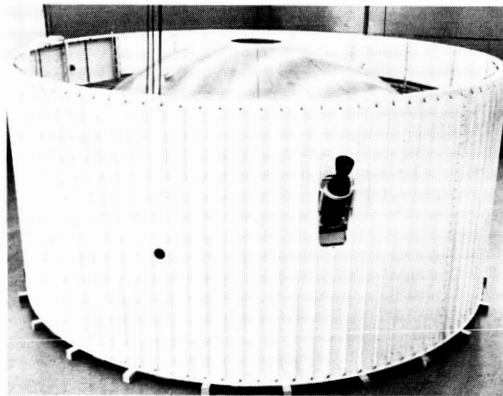
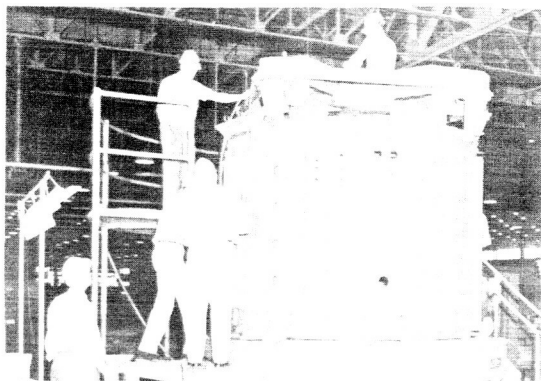


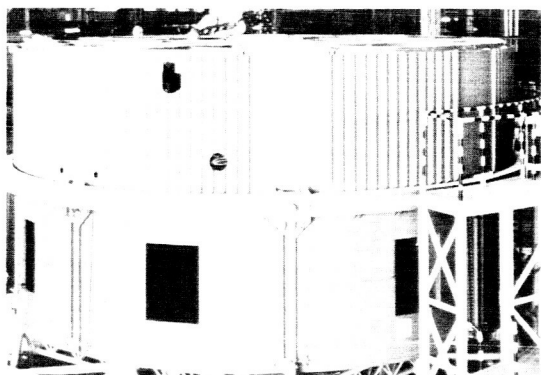
FIGURE 138. S-IVB FORWARD MOCKUP

May 1963

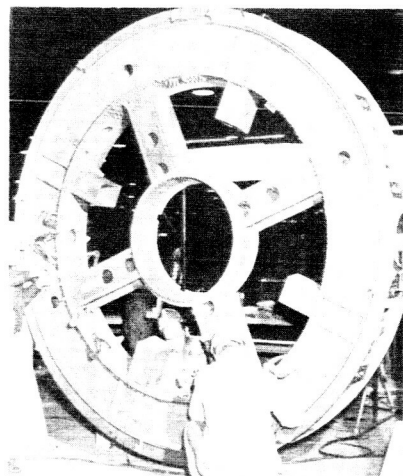
On May 18 at Michoud, clustering of propellant containers was completed for S-I-8, the first booster being fabricated by Chrysler Corporation (Fig. 139).



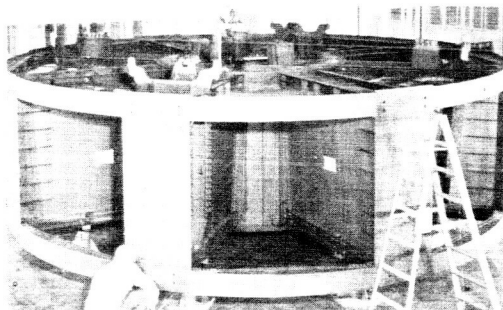
BARREL ASSEMBLY



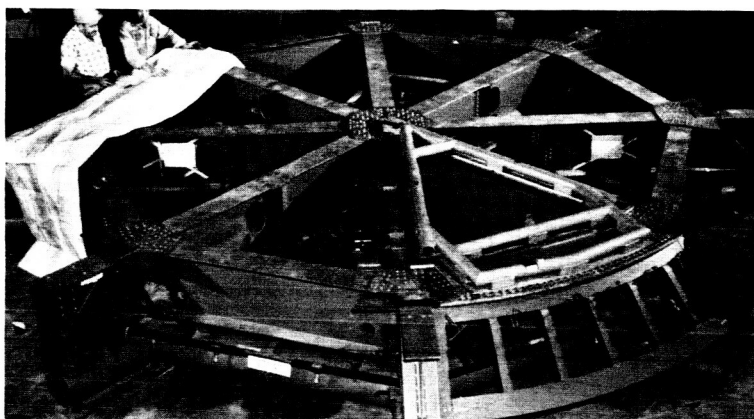
TAIL UNIT



LOWER THRUST RING



THRUST STRUCTURE

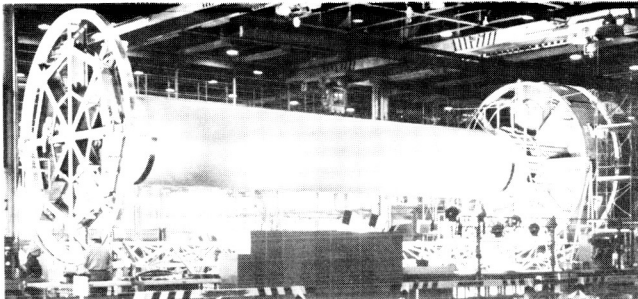


SPIDER BEAM

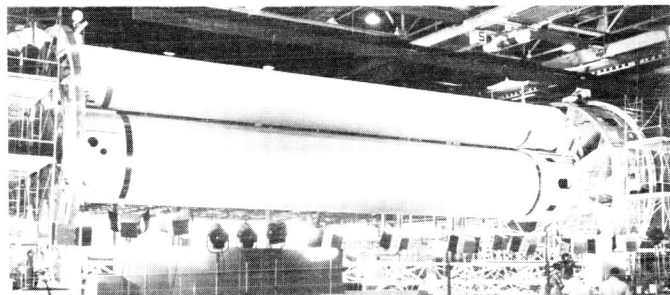
FIGURE 139. FABRICATION AND ASSEMBLY OF S-I-8 AT MICHLOUD



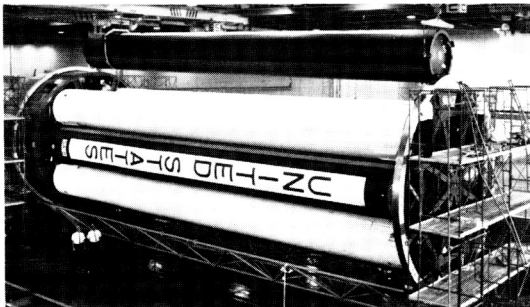
LOX AND FUEL TANKS READY
FOR CLUSTERING



INSTALLATION OF CENTER LOX
TANK



CLUSTERING 70-INCH LOX TANKS



CLUSTERING 70-INCH FUEL TANKS

FINAL ASSEMBLY

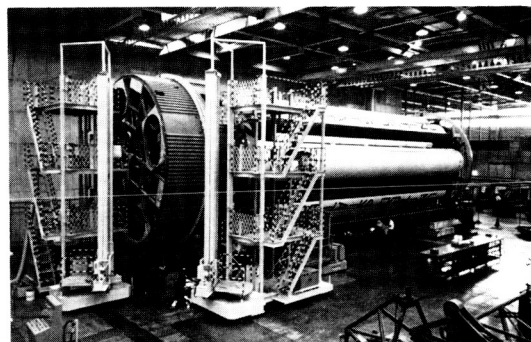


FIGURE 139. FABRICATION AND ASSEMBLY OF S-I-8 AT MICHLOUD

May - July 1963

During early May, the J-2 engine, used on S-IVB and S-II stages, was successfully fired for the first time at a simulated space altitude in excess of 60,000 feet. The engine developed 200,000 pounds thrust; after 20 seconds, the test was terminated as programmed.

On May 13, a firm cost proposal for incorporation of dual plane separation for S-IC/S-II stages was negotiated with S&ID. During mid-May, land clearing at Mississippi Test Operations began in preparation for the dredging of a barge harbor and access channel; a 10.5 mile track of railroad was completed into the test site.

Dynamic testing of the S-IV stage, Instrument Unit, and Jupiter-type payload was completed at MSFC during mid-May. On May 23, the Apollo boilerplate and associated units were installed and testing resumed; this phase of testing was completed on June 16. Also during May, MSFC engineers completed the design of the S-IC stage transporter.

On May 28, MSFC awarded a contract for FAA certification flights of a modified B-377 aircraft (Fig. 140). The aircraft will be used for transportation of the S-IV stage and other cargoes. Formal FAA certification was received on July 10.



FIGURE 140. PREGNANT GUPPY AIRCRAFT

During the first week of June, MSFC personnel began occupancy of the new Central Laboratory and Office Building. Also at MSFC, construction of the Saturn V Dynamic Test Tower foundation began in early June (Fig. 141). A full-duration, S-I-6 flight qualification static test (SA-15) was successfully conducted on June 6 for 142.37 seconds' duration. The inboard engines were cut off by LOX low-level sensors at 136 seconds and the outboard engines six seconds later. On June 17, the stage was removed from the stand for post-static checkout.

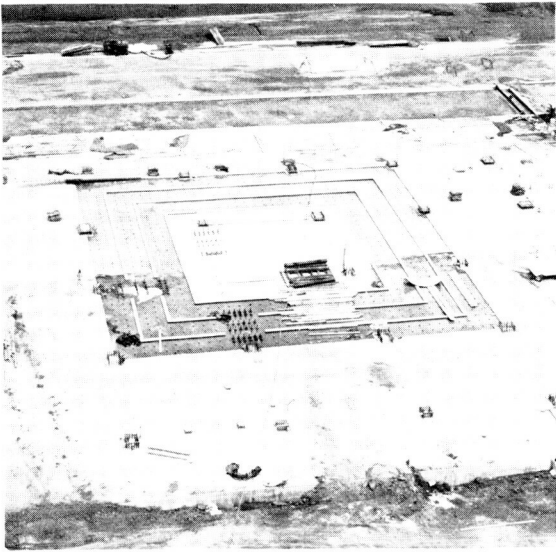


FIGURE 141. SATURN V DYNAMIC TOWER

On June 5, limited beneficial occupancy was granted on the S-IC stage Vertical Assembly and Hydrostatic Test Facility at MSFC (Fig. 142). Clustering of tanks for S-I-9, the last Saturn I booster to be

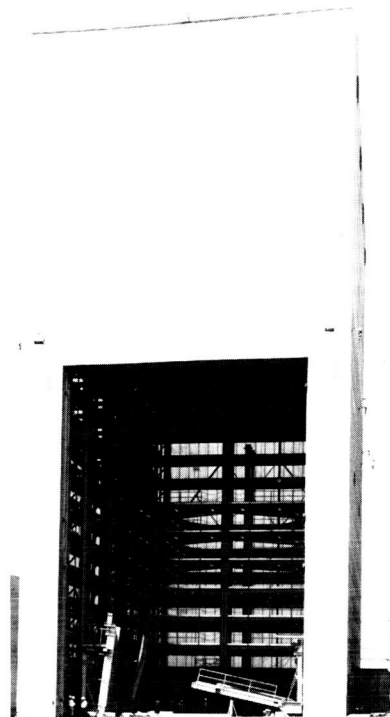


FIGURE 142. S-IC FACILITY

fabricated at MSFC, began on June 4 and was completed on June 19; in-board engine installation was completed on July 17 (Fig. 143).

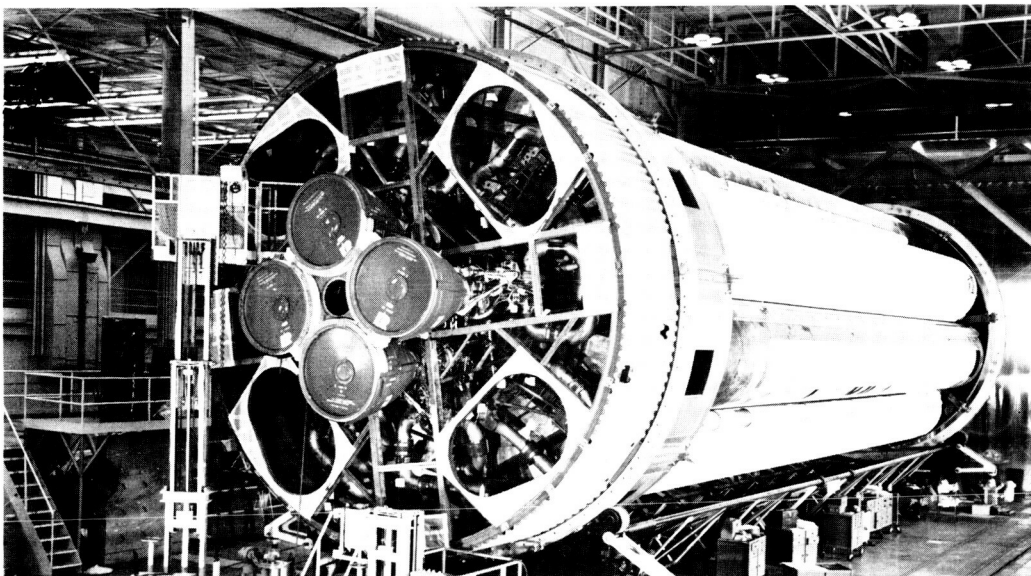


FIGURE 143. ASSEMBLY OF S-I-9 STAGE

June 1963

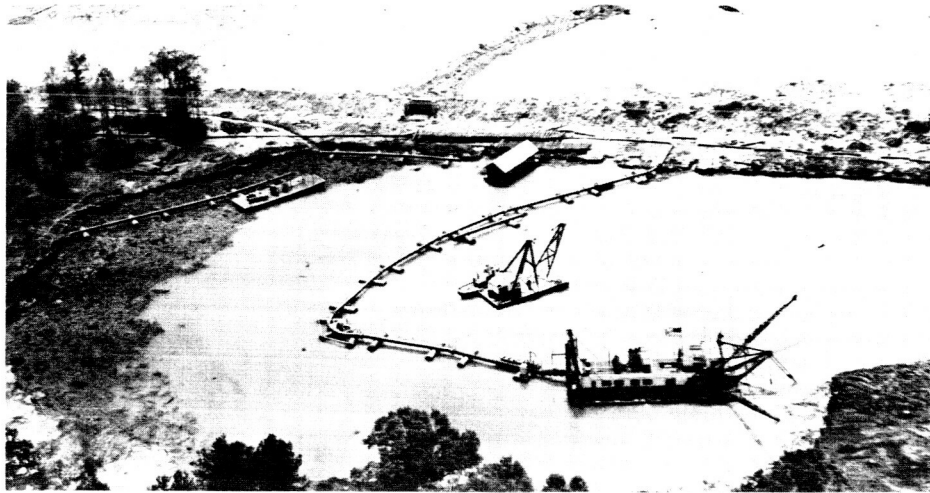


FIGURE 144. DREDGING AT MISSISSIPPI TEST OPERATIONS

On June 17, the Corps of Engineers awarded contracts for excavation for lock and Bascule Bridge, Emergency Service Building, dredging of East Pearl River and clearing of Saturn V complex at the Mississippi Test Operations (Fig. 144). At MSFC, gimbaling tests on engine No. 1 of the S-IV stage were completed in pitch and yaw directions on June 28. Three days later dynamic tests of the S-IV stage with Apollo boilerplate and launch escape system were completed.

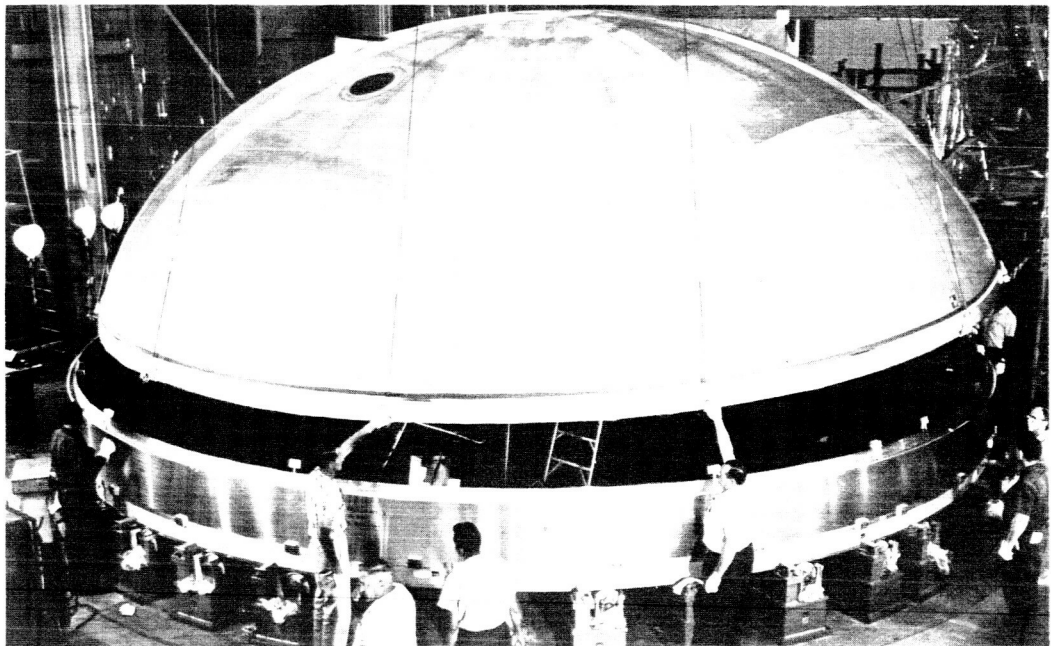


FIGURE 145. MATING BULKHEAD TO Y-RING

Prestatic checkout of the S-IV-5 stage at SACTO began on June 18. During late June, repair of the All-Systems common bulkhead was completed, and on July 6, the vehicle was installed on Test Stand 1 at SACTO. At Santa Monica, Douglas completed checkout of the S-IV-6 stage on July 19.

During June, the upper bulkhead for the test fuel tank was welded to the Y-ring at MSFC (Fig. 145). Also during June, facility checkout of Launch Complex 37 Pad B was completed at Cape Canaveral. The S-IV Dynamics/Facilities vehicle was flown to the West Coast for Flight Performance Test of the Pregnant Guppy aircraft. The S-I-D5 stage departed Cape Canaveral on July 1, aboard the barge Palaemon, arriving at MSFC on July 14; the stage will be used for additional dynamic testing.

On July 9, MSFC directed Chrysler to proceed with fin redesign as part of the S-IB stage redesign effort (Fig. 146).

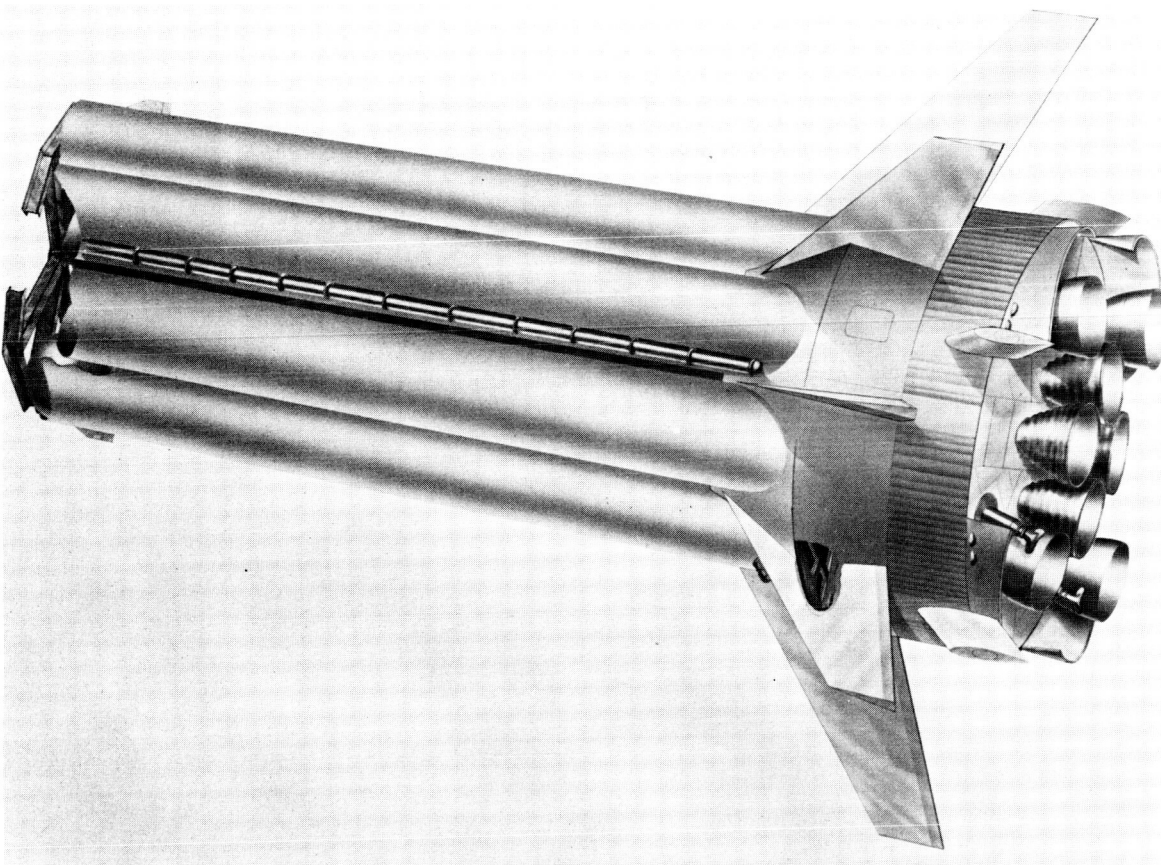


FIGURE 146. S-IB STAGE

July - August 1963

On July 25, the Corps of Engineers awarded a contract for construction of S-IC and S-II stage test stand foundations at Mississippi Test Operations. At MSFC during late July, the concrete towers for the S-IC Static Test Stand were completed and steel erection begun (Fig. 147).

During July, construction of foundations was completed for Test Stand 1 and 3 at SACTO Beta Complex. Also at SACTO, hydrostatic test and calibration of S-IVB Battleship tank was initiated on August 2.

During July, the S-IC upper cylindrical skin section was successfully welded to the Y-ring at MSFC.



FIGURE 147. S-IC STATIC TEST TOWER

On August 5, S-IB contract negotiations with Chrysler Corporation at Michoud were completed and, on the following day, S-IVB/Saturn IB contract negotiations were completed with Douglas Aircraft Corporation at Santa Monica.

On August 6, the Corps of Engineers awarded a construction contract for the Mississippi Test Operations Laboratory and Engineering Building. On the same day, MSFC awarded a contract for assembly of two S-IC transporters; assembly began two days later.



FIGURE 148. CONSTRUCTION AT LAUNCH COMPLEX 39

August 1963

During August, hydraulic dredging and fill operations were completed for the vertical assembly building at Cape Canaveral (Fig. 148).

On August 11, the S-I-5, S-IU-5, and Payload departed MSFC, aboard the barge Promise, for Cape Canaveral. At MSFC, a complete dynamics test vehicle of the SA-6 configuration was installed in the Dynamic Test Tower. Also at MSFC during early August, the S-IC aft area mockup was completed, with two F-1 engine mockups attached (Fig. 149).

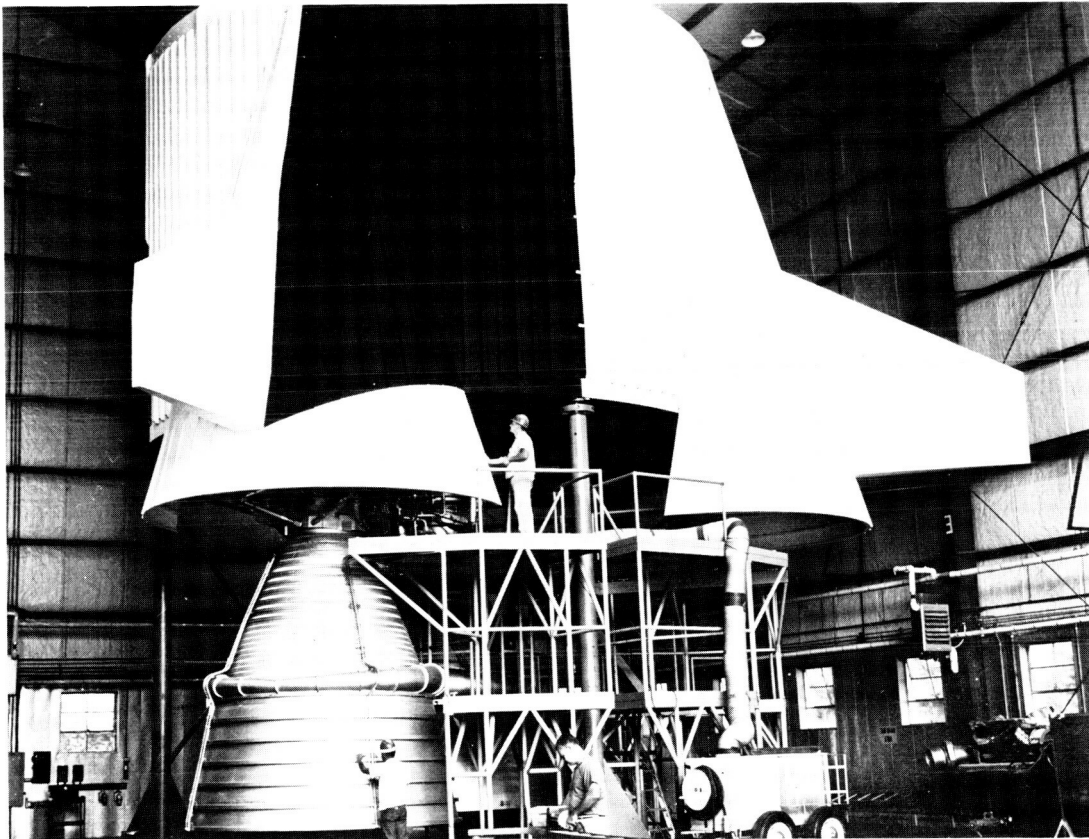


FIGURE 149. S-IC STAGE AFT AREA MOCKUP

August 1963

On August 5, the first attempt to acceptance fire the S-IV-5 stage at SACTO was aborted at 63.6 seconds due to an indication of fire in the engine area; however, inspection revealed a stand instrumentation malfunction. A successful, 477-second, full-duration, S-IV-5 flight qualification firing was conducted on August 12, (Fig. 150) and preparation began to check out the stage prior to shipment to Launch Complex 37B.

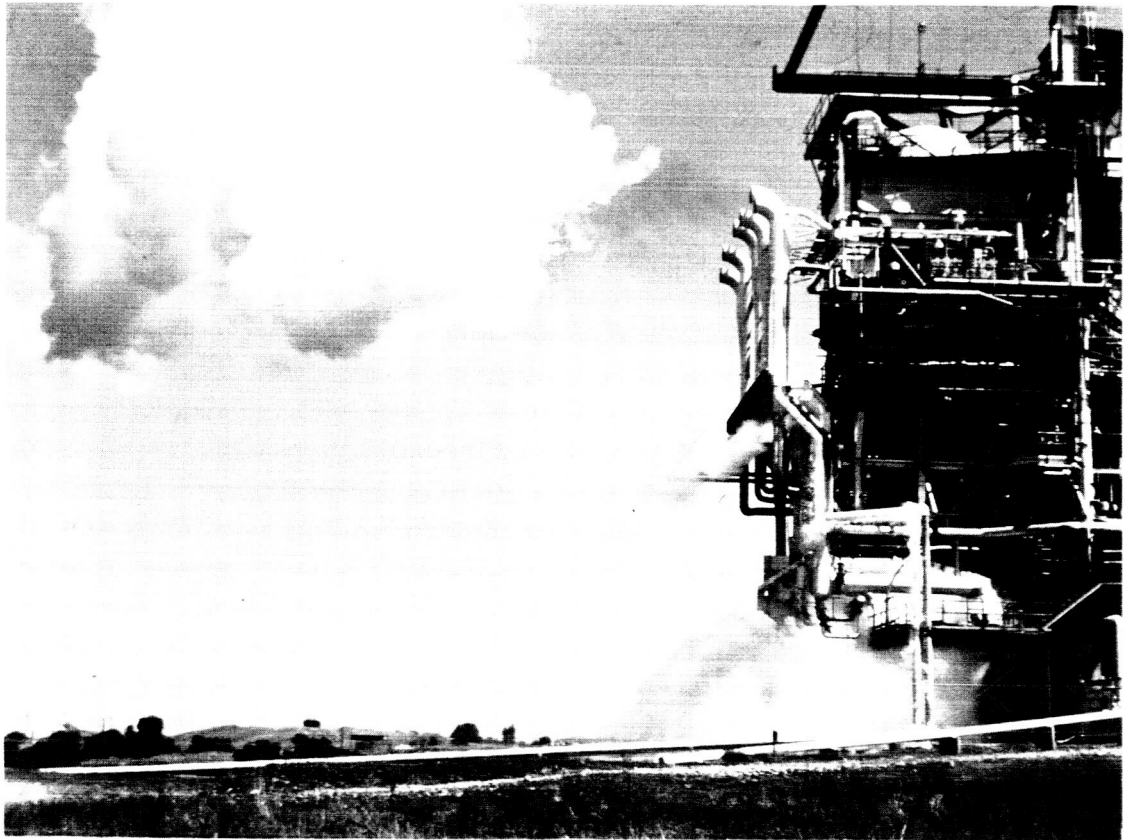


FIGURE 150. ACCEPTANCE FIRING OF S-IV-5 STAGE